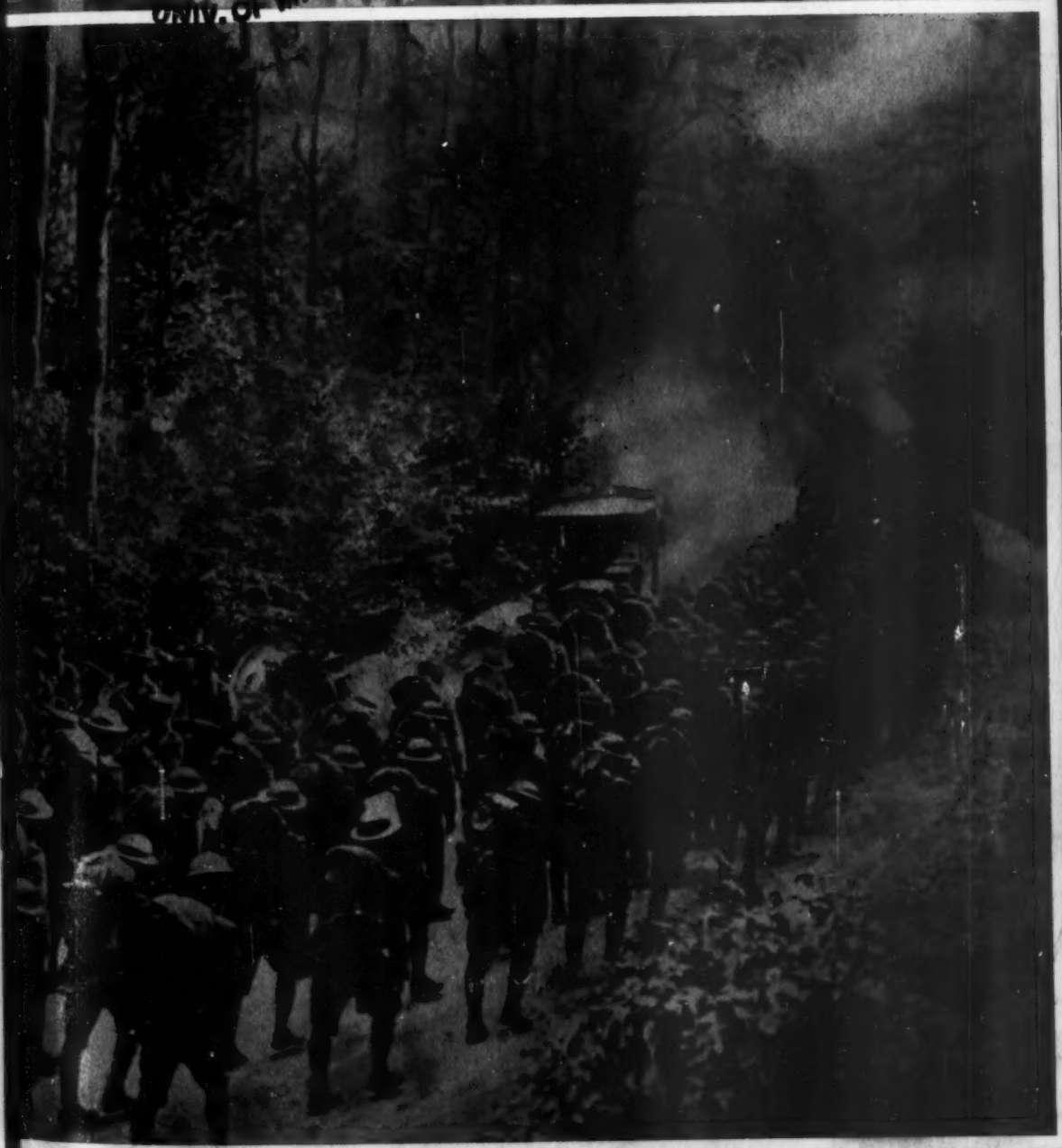
LUME XVIII OCTOBER, 1918 NUMBER

THE AMERICAN MUSEUM JOURNAL



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THE AMERICAN MUSEUM JOURNAL

CONTENTS FOR OCTOBER

MARY CYNTHIA DICKERSON, *Editor*

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Courtesy of State of New York Conservation Commission

SUCH IS THE DESOLATION IN NORTHERN FRANCE

A tree—unlike a man—receives unprotected the full storm of gunfire. Thus the trees which chanced to be along the firing line in France have given themselves for freedom. Their presence has allowed triumph with the least bloodshed in both offensive and defensive attacks,—but it will take a century to restore these forests of the battle front. Not only are the trees dead but the exposed forest floor also has been destroyed, tortured into hills and hollows and filled with fragments of metal and with shells that did not explode. The photograph shows a small part of the famous Height of Hartmannsweilerkopf in Alsace, captured and recaptured a dozen times by French and Germans. Many forests on the Alsatian slope of the Vosges Mountains are totally destroyed. Over slope and hilltop there is nothing to be seen but dark skeletons of trees, shell holes in the ground, and the countless crosses that mark the graves of the dead. The country about Verdun is described as "the dead hills of the Meuse," for the majestic trees of the Forest of Argonne stand today mere bullet-pitted stumps. This forest, thirty miles long and from one to eight miles wide, in the region of the Meuse and the sources of the Aisne, has seen more bloodshed than any other part of the wide battle fields of the Western Front. It saved Verdun, but the fighting transformed green hills and valleys into a place of death, into square mile upon square mile of desolation

THE AMERICAN MUSEUM JOURNAL

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Our American Forest Engineers in France

By LIEUTENANT COLONEL HENRY S. GRAVES

Chief Forester, United States Department of Agriculture

FORESTRY is playing an important part in the great World War. The vast requirements of the army for lumber and other forest products are placing a critical burden on the forests of this country and of our Allies in Europe; and foresters and lumbermen are called upon for the highest skill to produce the needed materials promptly and in adequate quantities. For the first time in history forestry regiments have been organized as a part of the army, to extract the raw material from the forests and to manufacture it in Government mills. It is a new thing for soldiers to carry on logging operations and to run sawmills. It is a new thing for soldiers to be practicing forestry. And yet this is exactly what is being done in this country, in Great Britain, and in France.

We are accustomed in the United States to a large production of lumber and other forest products. Our forest resources are still very great; and the first extensive demands for lumber for training camps, for shipbuilding, for boxes, for vehicle stock, for aëroplanes, and a variety of other war purposes, was met by the existing lumber industry, equipped as it is with many thousand sawmills scattered throughout the country. Later, that industry was unable adequately to meet the special demand for aircraft material without Government help. How the army is now handling the aircraft production with organized soldier help, how the American forests are being drawn upon for war materials, how the forest industries are being organized to meet the situation, and how the foresters are doing their part to furnish scientific information regarding the American woods, is a separate story of keen interest.

This war has often been spoken of as a war of engineering. Certain it is that the swift movement of men, equipment, and supplies depends on engineering skill of the highest character. Much of the engineering work must be constructed swiftly and it is often of a temporary character. This means that lumber, piling, round logs, poles, as well as small forest products, are required in great quantities by the armies at the front.

In the early part of the war the armies in France imported a great deal of lumber from England, Scotland, the Scandinavian countries, Russia, Canada, and the United States. To be sure, the forests of France immediately behind the lines were drawn upon heavily, and the French lumber mills throughout the country produced what they could, although handicapped by shortage of labor. Very early Great Britain was forced to cut heavily in the limited forests of England and Scotland. Owners of private estates patriotically sacrificed their woodlands and groves to meet the needs of the armies, for temporary structures at home, for the war industries, and for the forces in

France. To exploit these forests, battalions of skilled forest and sawmill workers from Canada were organized and equipped. It was to aid in this work that in 1917 several patriotic men in New England financed and sent over to "Old England" ten fully equipped sawmill units. It was a gallant act and deeply appreciated by the British authorities.

But the shipping of forest material to France was largely stopped in the spring of 1917 on account of the reduction of tonnage by the German submarine. It was then that France opened her forests to the Canadian forestry troops, to produce material for the British armies and to help the French engineers to increase the production of material needed by the French armies.

The entry of America into the war placed a new burden upon the French forests. At the beginning, a certain amount of lumber, piling, and crossties was shipped from this country. But the need of ship space for men and for equipment and supplies that could not be obtained in France was so great that the French Government itself requested that we send forestry troops to obtain our lumber and other general forest products from the French forests. Only those familiar with the French forests, with the long years of careful forestry that has been necessary to build them up, and with the sentiment of the French nation for its forests, can appreciate the great sacrifice involved in this action.

It was to prepare for the forestry

Courtesy of Underwood and Underwood and American Forestry

Trench mats for the comfort of the boys who stand day in and day out in the trenches during the rainy season.—Wood as an essential enters on a tremendous scale into the warfare of today, not only for aëroplanes and hangars, wooden ships and docks, not only for hospital and camp buildings, but also for trench timbers and *camouflage* materials, for temporary railroads, telephones, and bridges just back of the battle line. The miraculous must be accomplished in transportation of ammunition and food; there must be instantaneous communication with all parts of a long battle line. Therefore the forestry soldier sings as he pushes the work ahead, perhaps to the accompaniment of bursting shells and in sight of aëroplane fighting,—as one soldier writes: "If what we produce here is going to put the Sammies across the Rhine, you can all prepare to read soon that they have crossed over, for we are not going to let anything interfere with pushing things to the very limit"

work that the author of this article was sent to France in the summer of 1917. He was accompanied by Captain Barrington Moore who is connected with the American Museum of Natural History, and who rendered very valuable service both in this preliminary work in France, and since in handling important work as a member of the forestry staff there.

Today there are in France about 9000 skilled forest workers in addition to several thousand men organized as highway engineers and as labor troops to aid in the forestry operations. The forestry troops are organized as a part of the Corps of Engineers. The senior officers of the regiments are regular army officers, Colonel J. A. Woodruff, Colonel Mitchel, and Lieutenant Colonel Marks. The other officers were selected for their skill and experience in forestry and lumbering. In the headquarters office one finds such distinguished foresters as Lieutenant Colonel W. B. Greeley and Major T. S. Woolsey, Jr., and such experienced lumbermen as Majors G. A. Kelley and R. A. Johnson, of Oregon. It has proved possible to adapt the military organization to the industrial needs of lumbering, so that one finds the commissioned officers filling the various supervisory positions in charge of logging and milling operations, and the noncommissioned officers and privates acting as sawyers and edgers in the mill; or as sawyers, swampers, and drivers in the woods; or as blacksmiths, stablemen, and supply men at the camps.

Courtesy of Underwood and Underwood

Roadside trees near the French battle front, somewhere between the Marne and the Ourcq, afford shelter for American cavalry

These are the men who are producing the piling for our great dock extensions at several of the ports placed at our disposal by the French, the hundreds of thousands of railroad ties for the main lines of communication and the temporary lines behind the battle front, the many thousands of telephone poles needed to perfect the communications between our different fighting units, the almost limitless quantity of heavy road planks used in repairing roads for

the movement of artillery, the millions of board feet of lumber used in constructing training and rest camps, hangars for aëroplanes, temporary hospitals, emergency buildings of all kinds, and for miscellaneous general use at the front and in the rear; also the poles and other material used in trench construction, the excelsior to fill the bed sacks of the troops, and the thousands of cords of fuel needed for cooking, for heating, and for sanitation.

The forestry troops are located at many different points throughout central, eastern, and southern France. In several places there are as many as 750 to 1000 men logging for and operating from three to five sawmills. More often a single company of 250 men, or a detachment of from 80 to 125 men, constitutes the unit. The size of the unit depends on the quantity of available timber at any given point. In general it has been the policy to scatter the operations. It makes less of a burden upon transportation, since there is need for material at many different parts of the rear as well as of the front; and with comparatively small units it is possible to do better work in the forest.

The forests of France in which the Americans are operating are in part national, in part owned by communities or institutions, and in part private. The cutting rights are obtained through an interallied council for acquiring forests, called *Comité interallié des Bois de Guerre*. Through this council the available resources are assigned to the French, the British and Canadians, the Americans, and the Belgians. Where private lands are acquired the prices are stabilized, thus preventing speculation or competition between the allied nations. The procedure is one of many examples of the harmonious and unified action between the several Allies.

There are in France several forest

Photograph by H. S. Graves

Forests for cutting (the illustration shows young Scotch pines) are being obtained partly through grants from the French Government and partly through purchase from private owners. A tour of the forests in autumn brings to the eyes of the American vivid pictures of the beauty of the French landscape, with its splendid roads bordered everywhere with trees,—especially beautiful is the gold of road sycamores against the green of the pine forests

regions of considerable extent, each carrying an amount of standing timber astonishing to the average American. The most extensive forest regions are in the Jura and Vosges mountains of eastern France, and the extensive pine plains between Bordeaux and the Pyrenees Mountains. There is also a certain amount of timber in the Savoy and the Maritime Alps, and in the Pyrenees Mountains. In addition there are throughout central France scattered woodland tracts each of from a few acres to several thousand acres in extent, which have been cared for during many years and which offer favorable opportunities for lumber operations even from the American standpoint. We may well be proud of the natural forest resources in our own country. France, however, is proving that by years of thrift and scientific management she can now furnish the raw forest material that is essential for all the armies fighting on her soil. France has been furnishing the most striking proof of the value of forest protection and culture.

If one should drive through the Jura Mountains today, the forest would at first glance seem to him unchanged. He would see the slopes, the high ground, and the poorer soils covered with dense coniferous forests, some areas of forest large in extent, some occurring in smaller tracts, separated by fields, with here and there a village. His attention might be attracted, however, to a load of logs on one of the excellent forest highways, the logs cut about sixteen feet long and conveyed on an American lumber wagon; this in contrast to what he might have seen before the war, when a team of oxen would have laboriously drawn out the long trunk of a single tree, to be cut into shorter lengths at the mill. If the observer should go back to the forest from which this load of logs came, he would find a detachment of hardy American lumberjacks in khaki felling trees and drawing the logs to the skidways in American fashion. Yet there would soon appear a difference. The sawyers are cutting the stumps virtually at the ground. They are selecting trees marked by French foresters, leaving many standing that are not yet ripe. The lumberjack is exercising scrupulous care not to injure any of the young trees or the small reproduction. And when he has finished, there still stands a forest—reduced in volume of merchantable timber but in good productive condition. The lumberjack is practicing French forestry.

In the Jura Mountains occur some of the finest examples of French Government forests and forestry. The pre-

Photograph by H. S. Graves

Establishing camp in a Maritime pine forest in southern France, where logging conditions are about the same as in the long-leaf pine forests of Georgia. In the cold mountainous districts of France comfortable barracks are put up; otherwise tents with board floors are used. At times the sawmills run under pressure night and day, and always the lumberjacks work from sunrise to sunset

Courtesy of Underwood and Underwood

After the rain of shell and shrapnel fire which has mowed down enormous trees, some blackened and shattered trunks still stand as evidence of the fierceness of the battle. These may be pulled down by the troops and used for firewood in the trenches. They have little timber value, as the bullets and fragments of shell embedded in them render sawing difficult

Courtesy of Underwood and Underwood

Long columns of American soldiers march to the firing line. It is for the support of these that the American Forestry Engineers work, sacrificing their own desire to get into the thick of the fighting, knowing that the harder they work the less difficult it will be for the boys at the front

dominant species is the silver fir, with a sprinkling of beech and spruce. Even American lumbermen, accustomed to the great size of the trees in American forests, must admire the stately silver fir, for it is a tree that reaches dimensions rivaling our eastern white pine. Many of the mature trees are from 2 to 3 feet in diameter, and produce from 1200 to 1500 feet of boards, and occasionally from 3000 to 4000 feet. One splendid example occurs in the forests where the Americans are working,—a tree more than 150 feet in height, exceeding 4 feet in diameter, with a stem clear of branches for 90 feet.

If our observer should go to the village near by he would find an American portable sawmill manufacturing the logs into lumber for army use. He would find the camp stables for the horses, the blacksmith's shop, comfortable buildings for the men, and all else that is necessary for logging and milling enterprise,—all, however, under military discipline. Further observation would show the manner in which these men are doing their work, both in the woods and at the mill. Not only is there the precision of a well-organized enterprise, but the men are working with a spirit not commonly seen. They know that the material they are producing is urgently needed by the army, that the success of the fighting depends on the result of their labor. Hours of work mean nothing to them. It is only the results that count. They themselves are an essential part of the fighting force. Their output is a fighting output. It is this spirit that is securing from mills of 10,000 board-feet capacity more than 30,000 feet in 24 hours, and is demonstrating that an industrial unit under war organization can produce far more than with the usual peace-time effort.

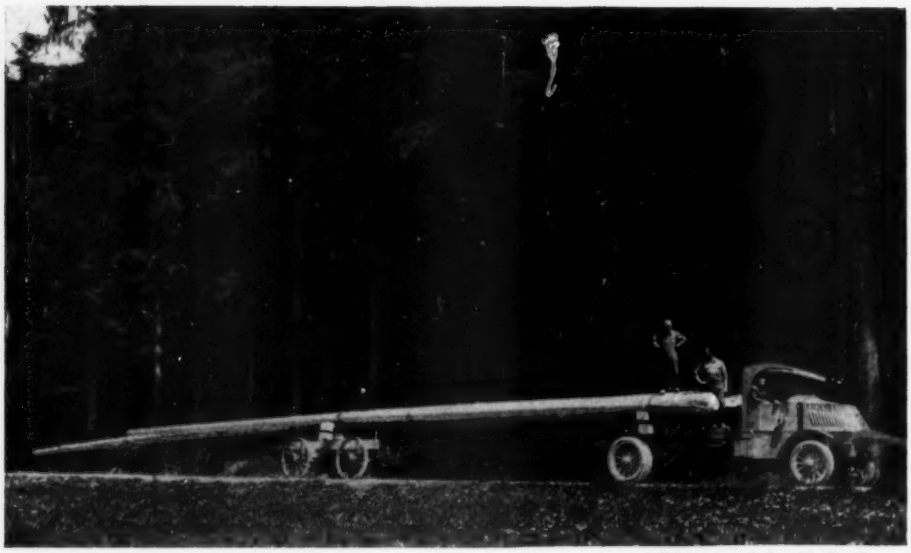
This is but an example of what is occurring throughout the forests of France. Similar conditions would be found at the four or five other locations of American forestry operations in the Jura Mountains, and at several locations in the Vosges Mountains, where the forests have much the same general character as in the Jura.

In central France the forests are chiefly oak and Scotch pine with a certain quantity of beech, ash, and other species of less importance. Some logging and milling units are cutting almost wholly in oak and beech, using the product for railway ties, bridge material, and road plank. It is interesting to see the adaptability of the American woods workers to French conditions. Some units made up chiefly of Pacific coast lumbermen, accustomed to the giant sugar pine or to the Douglas fir, are working in hardwood forests. They work up the logs into ties and other products. Then they cut the branches into fuel, and finally bind the twigs into fascines for use at the front in repairing roads.

Some of the oak and beech is of excellent size and quality. In one forest an American unit is cutting oak timber about 200 years old, with many trees 2½ feet in diameter, tall, straight and as clear as any oak of the southern Appalachians. In some other cases the bulk of the oak is smaller and chiefly useful for railroad ties.

In central France, too, the French foresters have encouraged the growth of Scotch pine, by planting and by natural reproduction. It is careful forestry that has produced stands of this species, which at only 60 to 80 years of age carry 20,000 feet to the acre. A number of small mills are cutting lumber from such stands, while in the younger stands the forestry troops are producing hundreds of thousands of poles for telephone lines, and short pieces for trench material.

Still a different condition prevails in southwestern France. North of the Pyrenees Mountains stretches a great plain largely covered with a pure forest of Maritime pine. It is, to be sure,



Photograph by H. S. Graves

The trees of France are proving themselves silent defenders of the nation. After America entered the war one of the first demands on the Western Front was timber for piling, because new docks and extensions to old docks had to be constructed in haste to accommodate rapidly arriving troop ships and ships loaded with ammunition, military equipment, and food. Fortunately, the silver fir forests of France correspond with what American forests of white pine were in the past. At once, under the work of the American Forestry Engineers, these forests yielded straight and flexible trunks from sixty to ninety feet long, in the necessary quantities

Photograph by H. S. Graves

A silver fir forest in the Jura Mountains, from which the American Forestry Engineers have cut the old ripe timber, using all possible care to leave the young trees uninjured and the whole in condition for prosperous future development. Logging conditions in these forests are much like those in the Adirondacks, except that the trees are of larger size. Dense stands of mature silver fir, especially in the Vosges Mountains, arouse the enthusiasm of even those American lumberjacks who have worked among the great trees of the Pacific Coast

Photograph by H. S. Graves

The American forester will come home after the war with a new respect for conservation. He is learning to appreciate the need for complete utilization of every tree cut. Even the smallest branches are put to use, thus preventing the necessity of cutting young trees for small timber. The German army in the French forests on conquered territory have ruthlessly destroyed hundreds of thousands of small trees for corduroy roads, fuel, wire entanglements, and screens for their trenches and guns

Photograph by H. S. Graves

German prisoners are often employed by the French to help get out fuel and small timber for the uses of the Allied armies

As director of the Division of Forestry with the Expeditionary Forces, the writer was one of the first Americans seen in our uniform in portions of the western war zone. The welcome in the villages that this uniform received from the children and the older people was tremendously affecting. Everywhere the French realized that a nation was coming across the sea to fight with them in a common cause

broken by small farms and communities, but in many areas fully 75 per cent of the land is in forest. It is this pine that furnishes the French turpentine. It is here that we have the example of how we should develop the turpentine industry of our own southeast.

The Maritime pine is not a large tree. It is very commonly from 18 to 28 inches in diameter at 70 years of age, with a height of from 70 to 80 feet. It is, however, furnishing a basis for the operation of a number of the American forestry units, yielding lumber, piling, poles, and railroad ties.

The scale of the American forestry operations in France is a large one. For the first half of July there were produced for American needs about 13,000,000 board feet of lumber, 155,000 railroad ties, more than 1200 piles, and a great quantity of fuel. This does not include the product of one American forestry battalion working for the French, and one battalion working for the British.

Necessity has forced the extensive use of the French forests in order to win the war. Every effort is being made to carry on the woods operations in a way that will leave the forests in a good productive condition. The French foresters mark the trees to be cut and indicate the other restrictions necessary to secure good forestry. It is hoped also that the forest roads will be left in as good or better condition than when the Americans began their work. Whether the American foresters can undertake any actual work of planting on the areas where they have worked or on the devastated areas of the war zone remains a question to be settled later. It is hoped that assistance can be given on both classes of land. Back of the lines the forests cut under forestry principles will recover very rapidly. In the zone of devastation the forests have been crushed down and ruined.

Still again one of the tragic injuries to France is the destruction of many of her roadside trees. All have heard of the destruction of the trees in the line of fire, and of the wanton felling of trees by the Germans. But in many places in the rear the French themselves have cut down the old poplar trees lining the highways. This has been done to supply local needs for lumber. It is hoped that the United States may be able to assist France in the replacement of her forests destroyed or injured during the war, and also of her highway trees, which have always furnished one of the picturesque features of the French landscape.

Courtesy of Underwood and Underwood

SUNSHINE ON A FOREST ROAD IN FRANCE

France has provided, by long years of thrifty and scientific forest management, a timber supply which, though insufficient for her own peace-time needs, is now meeting the demands not only of her own armies but also those of England, America, Canada, and Belgium. The depletion of their cherished forests, which is thus imposed upon the French nation, is a heavy but necessary war sacrifice. It is made with the same courage and solidarity with which the French people have met the enemy from the first and have borne the suffering and personal and national loss that have come with the years of fighting on their home soil. The American Forestry Engineers go to their work daily with rejoicing that they have the privilege to help France win the war.

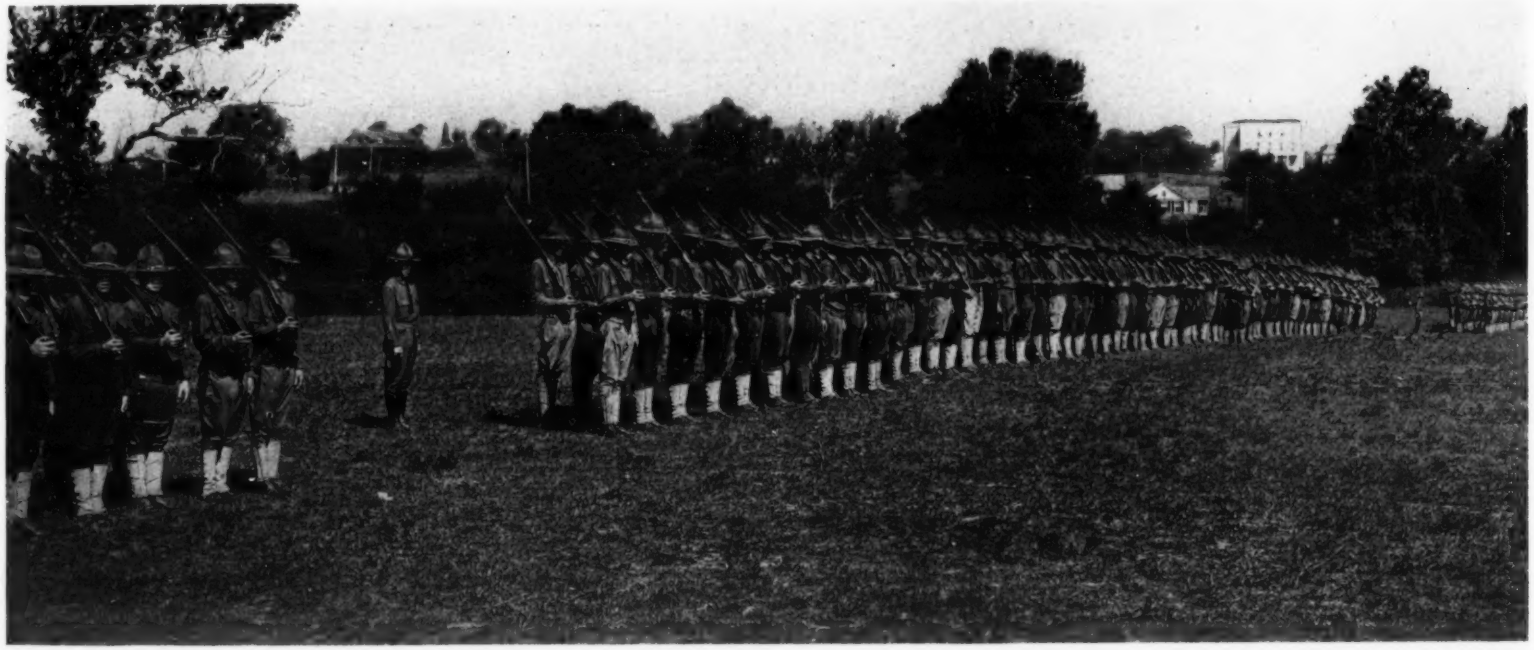
The most extensive forest regions of France are to be found (1) in the northeast, between Alsace and France in the Vosges Mountains, and along the Swiss border in the Jura Mountains, (2) in the southwest, along the Spanish border in the Pyrenees and on the plains between Bordeaux and the Pyrenees, and (3) in the southeast, along the Italian border in the Maritime Alps and in Savoy. There has been great fear for the historical forest of Fontainebleau near Paris, but that fear is now past. After the war, timber from other countries will come to aid in the rebuilding of the devastated areas. Russia, the "Land of Forests," for instance, has had small loss of timber. The United States may be able to help materially in the work of reforestation

Courtesy of Underwood and Underwood

DESTRUCTIVE WORK OF THE GERMAN ARMY AT CAMBRAI

The Germans in trying to put every hindrance in the way of the advancing British Army at Cambrai, felled great trees to block the road (the size of the trees can be estimated by comparison with a soldier walking at the left). The war has converted much of the country of the war zone into a man-made desert. One of the most evident losses is that of the street and roadside trees. Where these have not been sacrificed for military purposes, they have, in many cases, been cut down by the French civilians to meet home needs. The tall picturesque Lombardy poplars of the highways have gone this way. It is reported that great quantities of timber cut by the Germans from the French forests in their possession have been shipped back to Germany. The Germans have cut down or girdled fruit trees over vast areas—apple, peach, plum, and cherry, which had been growing for years. In some cases the foresters and tree surgeons have succeeded in saving such trees by careful work in grafting

peach, plum, and cherry, which had been growing for years. In some cases the foresters and tree surgeons have succeeded in saving such trees by careful work in grafting



THIS IS A WAR OF RESOURCES: IT IS A NEW THING IN HISTORY FOR SOLDIERS TO ENTER EXTENSIVELY INTO LOGGING OPERATIONS IN A WAR ZONE

The 10th Forestry Engineers, a company of which is here shown on final inspection in America, have been in France since the early autumn of 1917. This regiment was the response of the lumber industry and the forest service of the United States to the need in France for skilled selection of trees and their swift conversion into timbers for the battle front. Company F of the 10th has the honor of having manufactured the first board made by the American troops in France. An industrial unit on the basis of a military organization, this regiment has brought forth results quickly; for there is never failure for a soldier and a thing is accomplished because it must be.

Various companies of the 20th Engineers (Forest) were soon added to the 10th—with the exception of the ninety-five men who were lost on the "Tuscania" when it was sunk by a German U-boat off the coast of Ireland. This second regiment was planned as the largest in the world, nineteen battalions, ten of foresters and lumberjacks, and nine of laborers to coöperate with them. It was increased by three new battalions of experienced road and bridge builders, giving a military organization of twenty thousand men. The personnel of these regiments is very high. If lumber will help win the war, these men are in France to stay until there is no longer any need for the boys on the battle line to go "over the top"

"Photosynthesis," or Sugar and Starch Manufacture

THE GREEN PLANTS OF OUR WAR GARDENS STAND FOR THE MOST FUNDAMENTAL OF ALL THE WORK OF THE EARTH: THEY ALONE CAN MAKE FOOD FROM THAT WHICH IS NOT FOOD—FROM EARTH AND AIR

By JOHN M. COULTER

Professor and Head of Department of Botany, University of Chicago; President of the American Association for the Advancement of Science; Founder and Editor, *Botanical Gazette*

AT THIS time we are much concerned with our national resources. Much of our business has been reorganized to supply the materials needed, and as a consequence, we think of the essential work in terms of manufacture and transportation, work that depends upon the activities of men. Of course all this work is essential, but it is made possible by a still more fundamental process which should be realized. Men could not work without food and materials, but few realize how these are produced. In fact, so little thought was given to food production before the war that our population was increasing very much faster than our food production. This was the most important material problem this nation was facing before the war, and it became very acute as soon as we entered the war.

If men cannot work without food, neither can they work without materials, and fundamental among materials are wood and coal. Food and wood and coal may be regarded as the basis of our activities, and still very few know how these essential things are produced. *They are made by green plants!* The results of the work of green plants are food used directly or transformed in the bodies of food animals, coal deposits, forests of timber. Green plants have sometimes been characterized as the mediators between death and life, and this is true, in that through their work a dead world is transformed into a living world. They stand at the threshold of our life, of our resources and activities.

The word photosynthesis may not suggest its meaning to many people, but it stands for the most important process in the world. It is primarily the fundamental process of food production without which the world of organisms, including ourselves, could not live. Photosynthesis is chiefly the work of the foliage, because the leaves represent the greatest display of green tissue. To most of us foliage is simply a thing of beauty in a park or a landscape, but we must realize that it is also a laboratory for food manufacture, upon which the world depends. In this laboratory inorganic materials are built into organic substances, and upon these organic substances the green plants live and provide an excess sufficient to feed animals—and also those plants which are not green, such as the mushrooms and other fungi.

There are several general kinds of food as man classifies them, but the work of green plants has to do first and foremost with carbohydrates, such as sugar and starch—which, however, are in turn the basis for the manufacture of other foods.

The raw materials used in carbohydrate manufacture are about the most widely distributed materials on the earth; namely, water and carbon dioxide. The occurrence of water needs no explanation, while carbon dioxide is everywhere in the air. Green plants can manufacture food therefore wher-

ever air and water are available. The land plants, with which we are chiefly concerned in the production of food for the human race, obtain water from the soil, and carbon dioxide directly from the air in contact with the leaves. An interesting fact in reference to these raw materials is that they are also "ultimate wastes" when food is being used. This means that when living bodies are using foods, carbon dioxide and water are excreted because they cannot be broken up in the body as a preliminary step to the formation of new combinations. From food to waste is the work going on in all living bodies; from waste to food is the added work going on in all green plants.

The active agent in the manufacture of carbohydrates is the "chloroplast," which needs definition. Chloroplasts are minute green bodies within the cells that give green color to foliage. As the name suggests, they comprise two conspicuous substances: the plastid is the living substance (protoplasm), while the chlorophyll is a green pigment. The living plastid does the work, while the chlorophyll supplies the conditions for work; in fact, the chloroplast may be thought of as a chemical laboratory which uses raw materials in the manufacture of carbohydrates.

In order to work, the chloroplast must have a supply of energy, and this is obtained from sunlight. It is known that chlorophyll is able to absorb energy from light, for when light passes through it, certain rays are retained, and it is these retained rays that supply the energy with which the chloroplast works. It is an interesting fact that the rays of light not absorbed give a green color; that is, leaves are green because the green-producing rays are not being used. If the energy for photosynthesis is obtained from sunlight, it is evident that at night the process is suspended; in fact, many plants live through the winter without any opportunity to manufacture carbohydrates. It must be evident that a process which is suspended for a considerable period during every twenty-four hours, and which may be suspended for months, is not a process of living, for living must go on continuously. It is simply a manufacture that provides material used in the process of living.

The process of carbohydrate manufacture has been called "photosynthesis" because the word means "putting together in the presence of light." The first step in the process is the breaking up of water and carbon dioxide into their constituent elements. Water consists of hydrogen and oxygen, and carbon dioxide of carbon and oxygen. To break up these two substances in our university chemical laboratory requires a great display of energy in the form of heat or electricity, but it is accomplished by the chloroplast in the laboratory of the leaf without any unusual display of energy. Following this breaking up of the raw materials, the freed elements are put together in new combinations, this being the "synthesis" referred to in the name. It must not be supposed that a carbohydrate is the result of the first synthesis, for it is reached only after a series of chemical changes.

The final product of photosynthesis is reached when a carbohydrate is formed. In the production of a carbohydrate, not all of the elements of the raw materials are used. As much oxygen is left over as entered with the carbon dioxide, and this oxygen is a by-product which is being given off when green plants are engaged in photosynthesis. (The name carbohydrate, meaning carbon and water, is given because it contains carbon and also hydrogen and oxygen in the same proportion as in water.) The total result seems to be to get the carbon out of the carbon dioxide and combine it with water, and therefore the process is often called the "fixation" of carbon; that is, getting

carbon out of a gas and "fixing" it in a solid. Since hydrogen and oxygen are both gases, carbon is the only solid that enters into the fabric of the plant, and this solid is obtained from a gas that exists in the air.

The carbohydrates thus formed in the plants are usually starches or sugars, and they are freely transformed into one or the other. Starch is spoken of as the storage form, but when the carbohydrate is being used and is moving through the plant, it is in the form of sugar, for a substance must be in solution to be carried about, and therefore sugar is spoken of as the transfer form of a carbohydrate.

When it was first discovered that green plants take in carbon dioxide and give out oxygen, it was natural to suppose that this gas exchange represented the respiration of plants. Since the gas exchange in the respiration of animals is just the reverse, the opinion became current that plants and animals differ in their "breathing." Since this impression is still current, its correction should be emphasized. It is clear that photosynthesis has nothing to do with respiration, for respiration is associated with what may be called the act of living, and therefore is carried on by every living thing all of the time. If respiration stops, the plant or animal is dead; in fact, we use respiration as a sign of life. Therefore plants and animals "breathe" alike, both taking in oxygen and giving out carbon dioxide; but green plants carry on the process of photosynthesis also, in connection with which carbon dioxide is taken in and oxygen is given out. The confusion arose from the fact that during the day, when photosynthesis is going on, the amount of gas exchange involved in the manufacture of carbohydrates is so much greater than the amount involved in respiration, that the latter was not noticed. If the observation had been extended into the night, however, it would have been discovered that only the gas exchange of respiration was being carried on.

Carbohydrates are by no means the only foods that plants make, and therefore photosynthesis is not their only process of food manufacture. Another conspicuous group of foods is the group of proteins, which may be regarded as foods in the most advanced stage as living protoplasm is largely composed of proteins. Carbohydrates, therefore, may be thought of as the first stage of food, and protein as the last stage. It is known that neither light nor chlorophyll is required for the manufacture of protein, for the process goes on in living cells removed from light, and in plants containing no chlorophyll. It is known, however, that carbohydrates are used, and that to the carbon, hydrogen, and oxygen supplied by them, the elements nitrogen, sulphur, and often phosphorus are added, and these elements are obtained from their combinations in the salts of the soil.

The rôle of green plants in the world, therefore, is evident. It is only by them that food can be made from that which is not food. For this reason they are the only independent organisms, that is, independent of the work of other organisms. When we see the phrase "nothing but leaves," with its implication of failure, we must realize that leaves stand for the most fundamental of all the work of the earth, without which there would be no world of living beings.

Racial Types in the Population of the United States

THE "MELTING POT" MAKES AMERICANS OF US ALL AND PRODUCES RAPID CHANGES IN CUSTOMS AND LANGUAGE, BUT IS SLOW IN BREAKING DOWN THE BARRIERS BETWEEN DIVERSE BIOLOGICAL RACES

By L. R. SULLIVAN

NOW that the great World War is doing so much toward breaking down nationalistic feeling between the different elements of our population and making Americans out of citizens who heretofore have prided themselves on birth in some foreign land, it is interesting to inquire into the biological significance of the term "American."

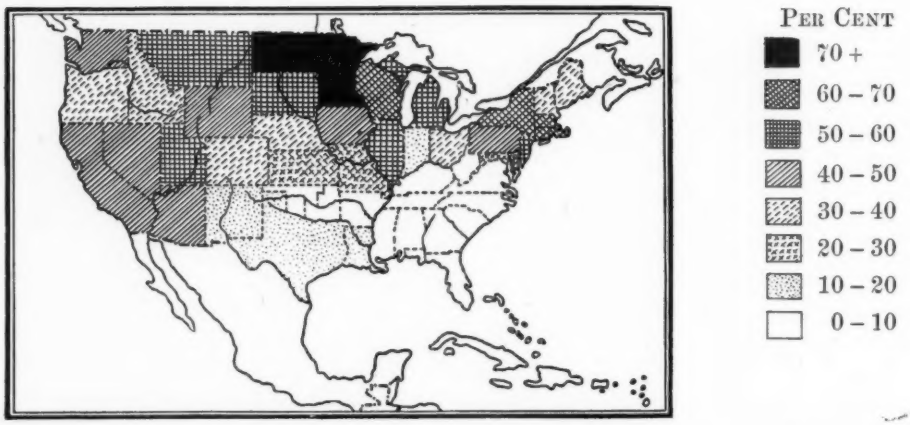
It is no new thing to say that in the United States we have an unusually large number of nationalities, each represented by thousands of individuals, living side by side. In fact, so accustomed are we to hear America spoken of as the "Melting Pot" that few of us stop to consider the significance or applicability of the term. To most of us it invariably provokes the conception of a very badly jumbled and thoroughly mixed condition of people and affairs, in fact a sort of biological hash. A little investigation into the matter seems to indicate that the mixture is more truly cultural and linguistic than biological.

No nationwide anthropometrical investigation has been made in the United States. How then can we get any light on the racial characters of our population? Obviously the only resource in lieu of a badly needed survey is to trace our population to its original sources and study the results of anthropological surveys of these countries. While such a method cannot give the desired accurate information, it should at least help us to form some conception of the probable status of the various racial types in our country.

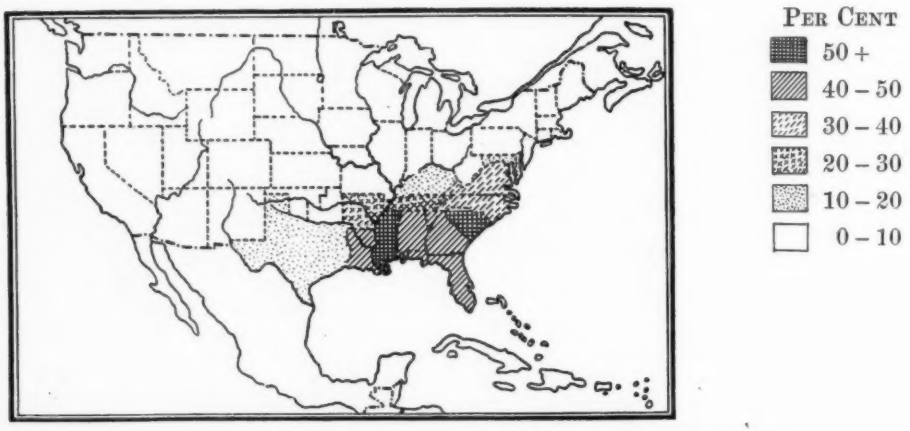
Foreign Stock or Different National Groups in the United States

While it would be next to impossible to trace accurately the sources of our entire population, it is a comparatively simple matter to obtain the origin of a very large sample. I refer to the so-called "foreign stock" of our census. "Foreign stock" includes all those individuals born in a foreign country or having one or both parents born elsewhere than in the United States. Some idea of the size of this sample will be obtained from the fact that this foreign stock comprised 35 per cent of our total population at the time of our last census. Add to this the fact that about 11 per cent of our entire population of 93,000,000 are Negroes and we have accounted for nearly half our population. A sample which includes 46 per cent of a group of 93,000,000 individuals is surely sufficiently large to throw some light on the true status of affairs.

One disconcerting fact about this sample is that it is not evenly distributed throughout the various states. The proportion of foreign stock varies from less than 1 per cent of the total population in North Carolina to 72 per cent in Minnesota (see map 1). Very few of the states contain less than 10 per cent while the greater number contain more than 30 per cent. It is noticeable that just those states which



Map 1.—Percentage of Foreign Stock in Total Population by States



Map 2.—Percentage of Negroes in Total Population by States

Foreign stock includes all foreign-born individuals and also persons having either or both parents born in a foreign country. Of the total population of the United States 34.6 per cent are of foreign stock. The proportion varies considerably from state to state. It ranges from less than 1 per cent in North Carolina to 72 per cent in Minnesota. It will be noted that map 2, showing the distribution of Negroes in the United States, is to a certain extent complementary to map 1. The highest percentage of Negroes is found in Mississippi and South Carolina where they form 55 per cent of the total population. The foreign stock and Negroes make up 46 per cent of our total population

contain the smallest proportion of foreign stock accommodate the largest proportion of the Negro population (see map 2). So then, even with this unequal distribution of our foreign stock, the samples for the most part remain of sufficient size for a working basis.

Another objection to the method is the common belief that immigration is rather irregular and spasmodic in its actions. A careful study of our immigration records from 1820 to 1917 does not uphold this conception. Immigration advances comparatively slowly and steadily along very definite and well-beaten paths. Marked changes in the source or direction of migration are slow in gaining momentum and equally slow in being retarded. It is true that in the last fifty or one hundred years changes have occurred, notably in the increase of immigration from Russia, Italy and Austria, yet such are slow in effecting marked differences in the total population.[1]

First in numerical importance as a source of our foreign population is Germany, which contributed a little more than 25 per cent of that element of our population. With the exception of the New England states and a few of the mountain states individuals of German origin outnumber all other nationalities. However, were we to regard the natives of the British Isles as a unit the honors would be about equally divided between them and Germany. Since the proportions furnished by Ireland, England, Scotland, and Wales are so unequal it has seemed better to treat them as independent sources.

Ireland is the second great source of our immigrants, furnishing 14 per cent of our foreign stock. They, too, form a very important element in the greater number of our states. Canada is third with 9 per cent. Of late years Canada has formed an intermediate station for immigrants of English, Irish, Scotch, Welsh, and French descent. As yet they have not penetrated very far to the south and indeed they are unlikely to do so.

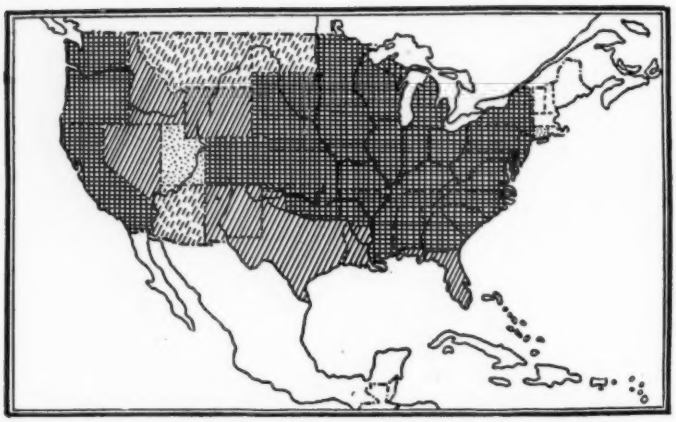
Russia is one of our most recent sources of population. In 1910 natives of Russia formed 8 per cent of our foreign stock. As yet the Russians have not penetrated very far inland, being distributed for the most part along the eastern coast. It seems reasonable to say that they have not yet reached the final stage of their migration but ultimately will present an entirely different distribution.

Direct immigrants from England are becoming fewer in number although many of our Canadian immigrants are of English origin. The English formed 7 per cent of our foreign stock, however, at the last census and their distribution would indicate that they have penetrated all parts of our country.

Map 8, indicating the distribution of Italians, does not really convey the actual importance of this element of our population. The total of 6½ per cent is widely distributed but is concentrated only in the states indicated. This is one of the few cases in which the immigration reports distinguish between different geographical areas in a foreign country and designate the proportion of north and south Italians. The south Italians are much more numerous among our immigrants than are the north Italians.

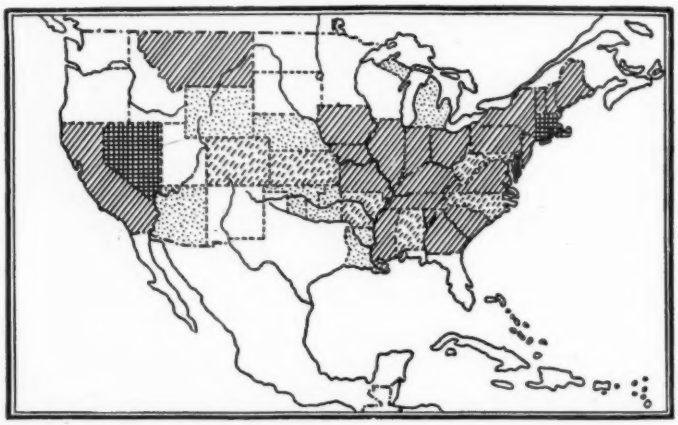
Austria also furnished more than 6 per cent of our foreign stock. The greater number of the Austrians seem to be concentrated in the north central states.

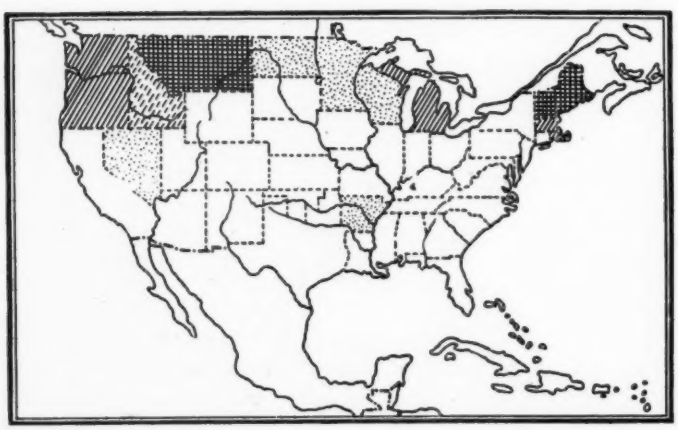
[1] On maps 3 to 14 I have plotted the principal sources of our foreign population by nationality and indicated the relative numerical proportion of each nationality in the various states. To avoid confusion in shading, only the four most important nationalities in each state are indicated. Almost invariably these first four nationalities comprise 50 per cent and in some instances as much as 85 per cent of the foreign population. More than that, in each state some one nationality leads all others by a generous margin, individuals of German, Irish, or Canadian origin often making up more than 50 per cent of the foreign population in different states.



MAP 3
GERMANY
Rank:
First
Second
Third
Fourth

MAP 4
IRELAND
Rank:
First
Second
Third
Fourth





MAP 5
CANADA
Rank:
First
Second
Third
Fourth

PRINCIPAL SOURCES OF OUR FOREIGN STOCK

Germany furnished 25 per cent of the foreign stock in the United States in 1910 and the Germans numerically were most important in the greater number of the states. Ireland furnished 14 per cent and holds second place in the greater number of the states. Canada is third in importance as a source of our population

MAP 6

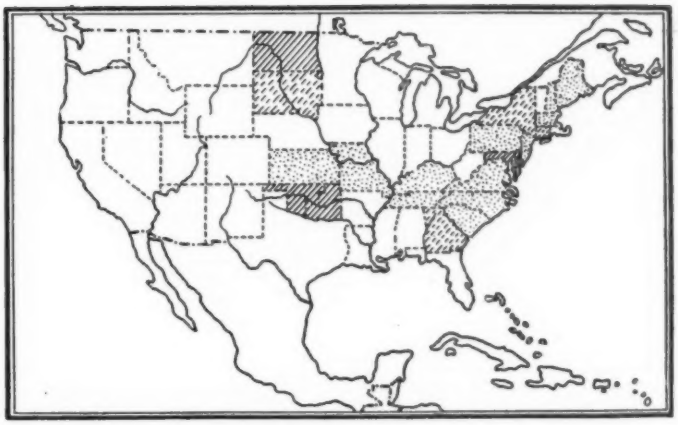
RUSSIA

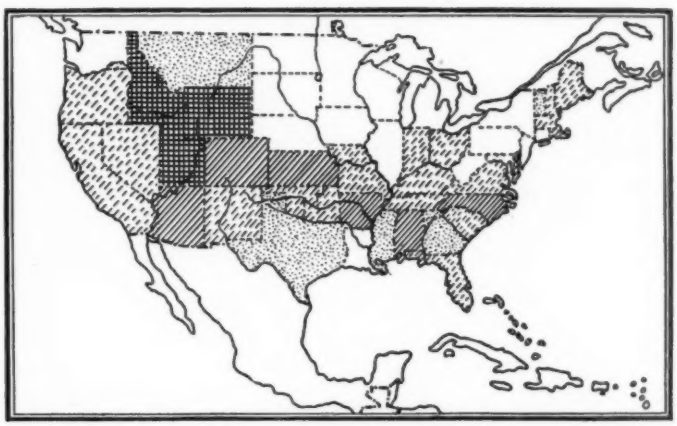
Rank:

Second

Third

Fourth





MAP 7

ENGLAND

Rank:

First

Second

Third

Fourth

MAP 8

ITALY

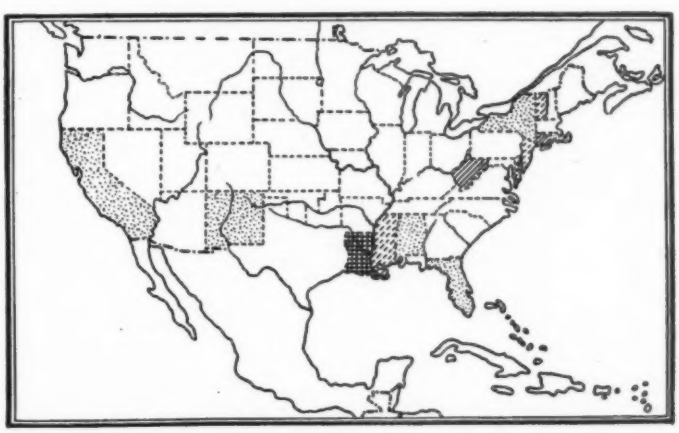
Rank:

First

Second

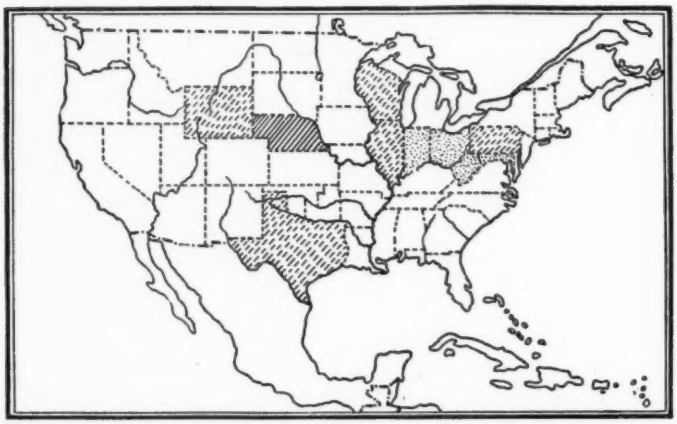
Third

Fourth



OTHER PRINCIPAL SOURCES OF OUR FOREIGN STOCK

Fourth, fifth, and sixth in importance, judging by the relative numerical ranking in each state, are Russia, England and Italy. The importance of Italy and Russia as sources of population is due to a relatively recent and increasing tendency to emigrate from these countries. England is gradually becoming less important as a direct source of population for this country



MAP 9

AUSTRIA

Rank:

Second

Third

Fourth

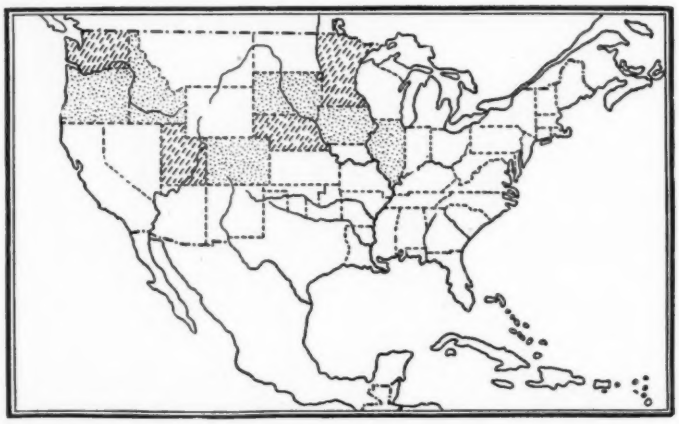
MAP 10

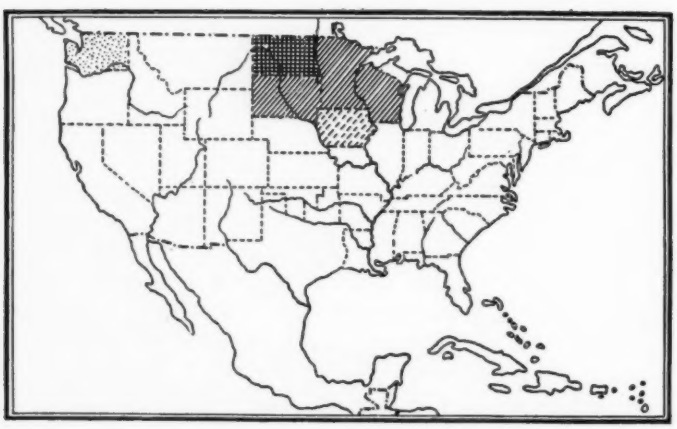
SWEDEN

Rank:

Third

Fourth





MAP 11

NORWAY

Rank:

First

Second

Third

Fourth

STILL OTHER SOURCES OF OUR FOREIGN STOCK

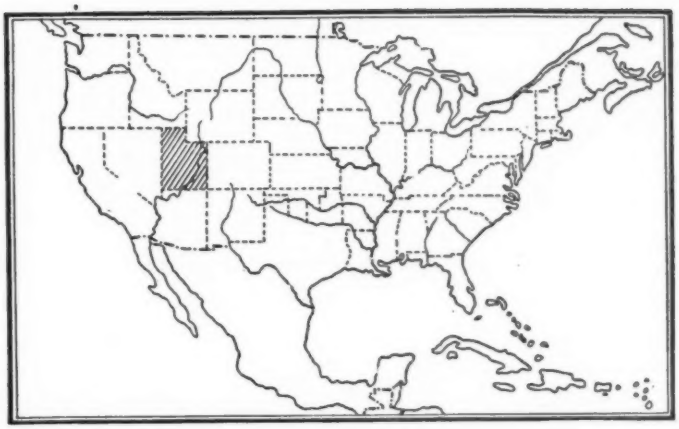
Emigration from Austria was increasing very rapidly before the present war. In 1914, Italy alone surpassed Austria as a source of foreign stock. Of late years immigration to the United States from Sweden and Norway has been on the decline

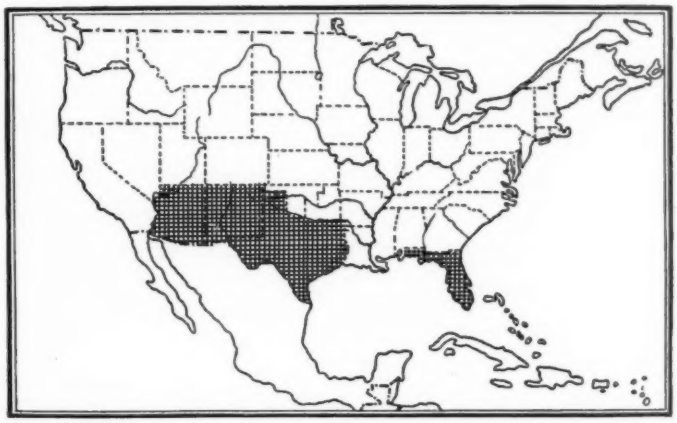
MAP 12

DENMARK

Rank:

Second





MAP 13

MEXICO AND CUBA

Rank:

First

MAP 14

FRANCE

Rank:

Third

MINOR SOURCES OF OUR FOREIGN STOCK

These maps show the relative numerical ranking of various national groups in each state. Immigrants from Denmark, Mexico, or France are fewer in number than those from Scotland, but the Scotch are not sufficiently concentrated in any one state to rank among the first four nationalities in numerical importance. The immigrants from Canada shown on map 5 include many people of French, English, Irish, and Scotch descent

Sweden and Norway have made important contributions to the north central and northwestern states. Utah is the only state in which the Danes are sufficiently concentrated to rank among the first four nationalities in importance.

Through Mexico and Cuba we have received a rather important Spanish element in some of our southern states. Since the outbreak of the war we have had an increase of Spaniards from other sources.

Louisiana is the only state in which immigrants directly from France are sufficiently concentrated to rank among the first four nationalities in importance. It should be remembered, however, that about 30 per cent of our Canadian immigrants are of French descent.

These maps (3 to 14), besides showing the sources of the foreign stock in different states, bring out several important points. Most important is the fact that our immigrants are not distributed at random throughout our country but that the peoples of a given nationality show usually one region of maximum concentration surrounded by areas of decreasing concentration. With the exception of the people of German, Irish, or English origin, these areas of concentration are fairly restricted. Even among the more cosmopolitan peoples the distribution is by no means random.

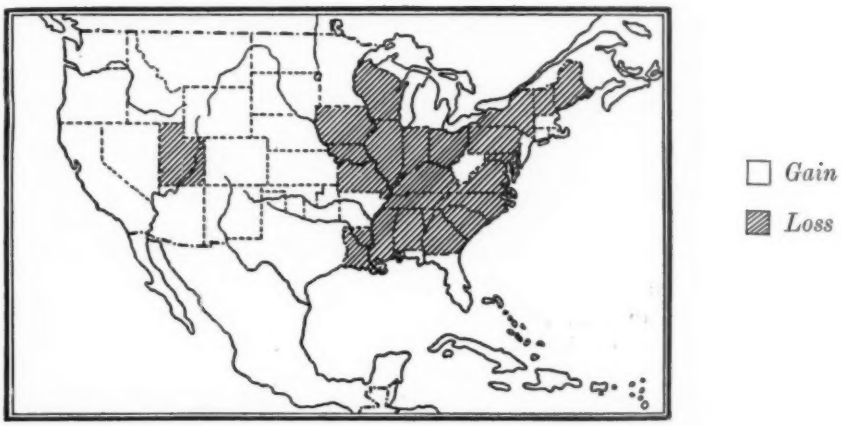
How far can we go in judging the past from the present? Such a regular distribution and localization of nationalities would seem to indicate that this is a very important factor in determining the distribution of our immigrants. Like attracts like. It is not assuming too much to say that this has always been one controlling factor and that the present distribution of our foreign stock will serve in a measure as an indication of the relative importance of the various nationalities in the various states.

Another important factor in the localization of national groups is interstate migration. Maps 15 and 16, based on our last census, show that the general trend of interstate migration is from east to west. Nearly all the eastern states have lost by this migration. It is also interesting to note that the lines of migration are generally from one state into another in the same latitude. Only in instances where there is some unusual drawing factor does migration depart from this rule.

Biological Races and Some Inheritable Characters Distinguishing Them

So far we have been dealing with nationality which is quite a different thing from race. It seems to be a common fallacy for a nationality to look upon itself as a biological race. We hear so often of the Irish race, the Jewish race, the Italian race, or the French race, and numerous organizations exist in this country for the purpose of perpetuating and fostering pride in and loyalty to these and other races. Even in America those of us who can trace back our American-born ancestry five or ten generations begin to look upon ourselves as something quite distinct and different from our newly arrived immigrants whom we are satisfied to lump together as foreigners. Yet the difference is largely a temporal difference. Anthropological research has proved that these fancied races do not exist as such. There is no such thing as an Irish race, an English race, a Scotch race, or numerous others that have been advocated. Differences, when they exist, usually consist in a difference in the proportions of the various racial elements represented in a nationality. The United States alone cannot lay claim to the distinction of presenting a heterogeneity of biological types. France, Switzerland, Germany, Austria-Hungary, Russia, and numerous other nations are close seconds.

What then is race? The average ob-



MAP 15.—STATES SHOWING A LOSS OR GAIN BY INTERSTATE MIGRATION

MAP 16.—THE GENERAL TREND OF INTERSTATE MIGRATION

The above two maps show that the general trend of migration within the United States is from east to west and generally in about the same latitude. Naturally on the Pacific Coast there is a slight counter migration inland. On the whole nearly all of the eastern states show a loss and the western states a gain by interstate migration

serving person feels certain that he can easily pick from a heterogeneous crowd the Jew, the Scotchman, the Irishman, the Englishman, the German, the Frenchman, the Greek, or the Italian. But when questioned as to the criterion for the selection, more often the basis will be peculiarities of the clothing, dress of the hair, beard or mustache, or even facial expression and slight mannerisms. But these are not permanent and stable characters by means of which we may always distinguish individuals of one nationality from those of another. The farther back an individual can trace his American ancestry the more difficult it is to guess the nation of his origin. This difficulty is due not to any marked change in biological make-up but to very great changes in language and culture.

For the purpose of determining the racial origin of an individual or group of individuals we must resort to the more staple biological characters. A character to be of any permanent value in distinguishing one race of mankind from another must be an inheritable anatomical character transmitted from parent to offspring. One has only to consider the complexity of the human body to gain a conception of the number and variety of these characters. It is probably safe to say that there are racial differences of varying degrees in every organ and part of the body. Thousands of these differences have been discovered and described and with our newer methods of research others are coming to light daily. Many of these differences are complex and minute and require special training and refined technique for their detection. But there are numerous very important racial characters with which we are all more or less familiar.

Of prime importance in anthropological analysis are the form and color of the hair. Human hair ranges in form from the coarse straight hair of the American Indians, Chinese, Japanese, and Malayans to the closely coiled and frizzly hair of the Negro. In color it grades from the pale blond hair of the Norwegians and Swedes to the very black hair of South European peoples, the Negroes, and the various Mongoloid types. The distribution of the hair on the body differs also. The Mongolian and many of the Negro types are characterized by very sparse beards and mustaches and the body hair is very poorly developed. Our European peoples, some of the inhabitants of southern Asia, the Australians, and the Ainu are characterized by profuse beard and mustache and an abundance of body hair.

We are all familiar with the marked differences in skin color ranging from the white skin of the North European peoples through the darker colored southern Italians and Spaniards, the yellowish brown Chinese and Japanese, the darker brown American Indians, and the dark chocolate brown or nearly black Negroes.

Closely correlated with the color of the hair and skin are differences in the color of the eyes. The North European peoples have blue eyes prevailingly as do also some of our Central European peoples. All the rest of the more deeply pigmented types of mankind have light or dark brown eyes. A blue eye differs from a brown eye, not in the nature of the pigment, which is the same in both cases, but in the amount and distribution of the pigment. When the pigment is confined to the deep layer of the iris the eyes appear blue or gray, but when the outer layer of the iris is also pigmented the eye appears brown or even black. Irises having only a small amount of pigment in the outer layer often appear green or greenish gray.

Another inheritable character is stature or height of the body. Perhaps we have occasion to note the extremes and range of differences for stature more often than for any other charac-

ter. Yet survey after survey of groups of reasonable racial homogeneity have shown that this character is not much more variable than the other characters noted above, and the average stature of regions with a fairly stable population has remained nearly the same for centuries. Among the Negroes we have both extremes of the very tall and very short racial types. The greater number of the continental Asiatics are short. The Europeans of the north are among the very tallest peoples while those of the south are considerably shorter.

Head form, too, is characteristic of racial types. It ranges from very broad round forms to very narrow long forms. The North and South Europeans, the Negroes with the exception of certain Oceanic types, the Semitic and Hamitic types, the Eskimo and certain American Indians are long-headed. The Central Europeans, many Mongoloid types of Asia, many Polynesians, and some American Indians are short-headed. To this list of characters could be added the extreme variations in the form of the nose, the proportions of the face, and indeed, proportions of the entire body. However, the above are sufficient for a general survey of the races of mankind represented in the population of the United States.

On the basis of the above characters it has become possible to classify all mankind into a relatively few groups. There is some difference in opinion as to the exact number and ranking of these groups, but these differences of opinion are, for the most part, differences in nomenclature and when analyzed reveal a very close agreement on relationships. Most anthropologists are satisfied to distinguish between four great groups or primary races of mankind: the lighter-pigmented European race with straight or wavy hair, fairly tall stature, and a rather prominent narrow nose; the yellowish-brown Mongoloid race characterized by straight black hair, poorly developed face and body hair, shorter stature, a broad face, and a nose very low and flat between the eyes; the more heavily pigmented Negro race with black frizzly hair, a broad nose, and most frequently a fairly long head; and fourthly, an Australian race with a dark brown skin, curly or wavy hair, well-developed face and body hair, and a broad nose.

Included in each of these primary races are several racial types that are characterized by certain peculiarities which distinguish them from other types of the same or different races. It should be said also that there are several smaller groups of mankind which seem to present characters intermediate between two races and are therefore difficult to classify.

The Three Primary Biological Racial Types of Europe

Since we have seen, however, that by far the greater part of our population is of European origin, we are concerned chiefly with the racial types represented in Europe. In the main there are three principal racial types in Europe: the North European, variously called the Teutonic, Germanic, or Nordic type, with blond or light brown hair, blue eyes, tall stature, an elongated head and face and a high and narrow nose; the Central European, known as the Alpine, Celtic or Slavic type, characterized by darker hair and eyes, medium stature, a shorter and broader head and face, and a large nose; and the South European, variously called the Mediterranean, Ligurian or Iberian type, characterized by black hair, brown eyes, a darker skin, long head, short stature, and fairly broad nose.

Besides these main types there are other racial types of lesser numerical importance. Although many of the Jews in Europe belong to the Central European type some of them clearly represent a Semitic type or an Armenoid type. It is absolutely impossible to make any reasonable estimate as to

just what proportion of each of these racial types is represented in the Jews of various nationalities, and no attempt has been made to do so. In Austria-Hungary, the Balkan Peninsula and Russia are representatives of several Asiatic types, but there, too, it is impossible to estimate the proportions of these elements. On the whole, though, it is safe to say that the inclusion of these types as one of the three European types tends to increase our estimates of the number of individuals belonging to the Central European type rather than to the North and South European types.

In Norway, Sweden, Denmark, Belgium, Netherlands, and the British Isles the North European type predominates. In the British Isles there are also representatives of the Central and South European types. The fact that throughout the Islands the head is rather long seems to indicate that the South European type has been more numerous than the Central European type. In Germany we have the North European type in the north and the Central European type in the south. Considering the country as a whole, the Central European type is perhaps more numerous. In France we have all three types: the North European type in the north, the Central European type in the central part, and the South European type in the south. Here too, in Dordogne, we have what is supposed to be a remnant of the paleolithic Crô-Magnon type.

In Switzerland and Austria the Central European type is predominant. The North European type, however, is of sufficient importance to be mentioned. In Austria the Armenoid type, supposedly related to the Central European type, also occurs. In Hungary we have several racial types which have been little studied and poorly described. The same is true of the Balkan States. The words Slav, Asiatic, Mongol, and Turki have been used so carelessly in describing them that it is difficult to make a very definite statement. On the whole it seems that the greater number of these people exhibit characters which would identify them as belonging to the Central European type.

Russia also presents several types. The Letts and Lithuanians are of North European type, the Great Russians and White Russians are mixed, and the Little Russians and Poles are Central European types.

In Greece the Central European type predominates but is mixed with the South European type. In Italy the South European type predominates in the south, the source of the larger part of our Italian immigrants, and the Central European type predominates in the north. Traces of the North European race are also said to occur. Finally, in Spain the South European type makes up nearly the entire population.

Population of the United States derived mainly from these Three European Types, from Negroes and American Indians. — Distribution among the Different States

Having then determined the principal sources of our population with some idea of the racial composition of these various nations, we are in a position to estimate approximately the racial types in the various states of our country (see maps 17 to 19).[1]

It is of particular interest to note

[1] The method in estimating the racial composition of each state was to assign each race a given value for a certain nationality and to weigh that value by the relative numerical importance of that nationality in a given state. The average for the first twelve nationalities in numerical importance in each state was taken. The same values were used throughout and if the results cannot boast of accuracy they certainly are consistent. On the whole I believe that the results can be relied upon to give us an idea of the true status of affairs. If I have slightly overestimated a racial element in one nationality I probably have underestimated it in another, so that in an average for twelve nationalities these errors should counterbalance and not appreciably affect the general results. All of the estimations and calculations were made before a single map was plotted.

that we do get a somewhat similar distribution to that we found in Europe. Although all of these three types are found in every state, nevertheless the areas of greatest concentration of a given type show some respect for latitude. The North European type is most important in the New England and northwestern states, the Central European type is most important in the Atlantic and east-north central states, while the South European type is most important in the south central states. What was true for the national groups is more or less true for the racial groups. Usually one racial type is considerably more numerous in a given state than the racial type second in importance. Notable exceptions to the rule are New York, New Jersey, Pennsylvania, Illinois, Wisconsin and a few other states where, as near as we can estimate, the North and Central European elements are about of the same frequency.

Some concern has recently been expressed on the general decrease of individuals belonging to the North European racial type. Although it is inevitable that the Central European type will become of first importance numerically unless there is some marked change in the general trend of immigration, at the present time the North European type is considerably in the lead, especially if we consider the population by states. The North European racial type is most numerous in about half the states, the Central European type in twelve and the South European type in only three. There also promises to be an increase in the number of representatives of the South European type in the future.

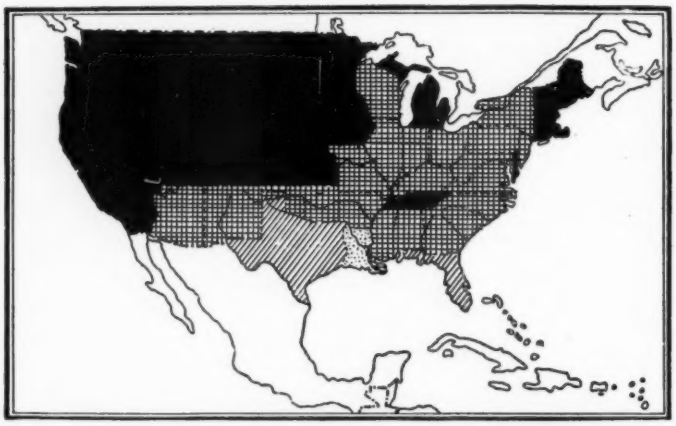
As mentioned before, these three European types also contain representatives of other racial types the importance of which it is impossible to estimate.

Besides these European racial types we have also representatives of two of the other primary races of mankind. The Negroes form nearly 11 per cent of our total population and are more important numerically than representatives of our South European type. The Negro race stands third in rank of frequency. Although the Negroes of the United States undoubtedly represent more than one type the greater number belong to the Nigritian or Sudanese type. They are rather tall in stature, have a long head, broad nose, thick lips, frizzly black hair, and dark brown skin. They still remain concentrated chiefly in the southern states, where they are the most numerous single racial element in eight of our states.

The American Indians, the original inhabitants of our country, are of rather minor importance numerically at the present time. They form only $\frac{3}{10}$ of 1 per cent of our total population. Only in a few of the western and southwestern states do they form any considerable percentage of the total population. They are relatively most numerous in Arizona where they form about 14 per cent of the total population of the state. Physically they are allied to the Mongolian race in hair form and color, eye color, character of the teeth, width of the face and, in some cases, the form of the eye and nose. The skin is slightly darker and in many instances the nose much more highly developed than in many Mongoloid types. The Japanese and Chinese also make up $\frac{3}{10}$ of 1 per cent of our total population. They, too, represent Mongoloid types.

Opinions as to the Valor of Different Races in the World War

From the maps showing the distribution of these racial types (maps 17 to 22) it will be seen that our population differs considerably in racial composition in different states. Each of these racial types has its champions who claim for it all that is high and noble.



MAP 17

NORTH EUROPEAN TYPE

Rank:

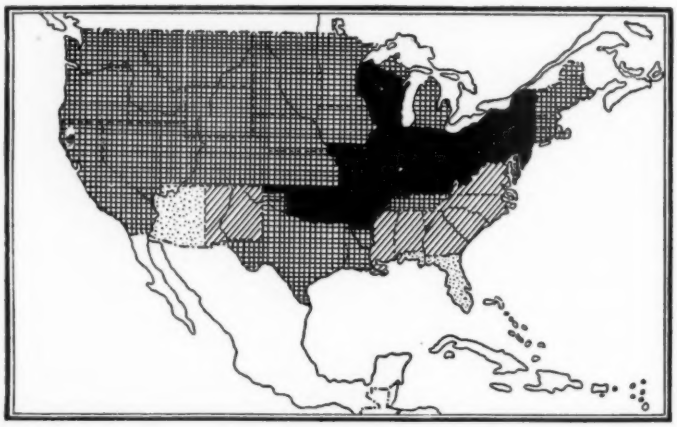
- *First*
- *Second*
- *Third*
- *Fourth*

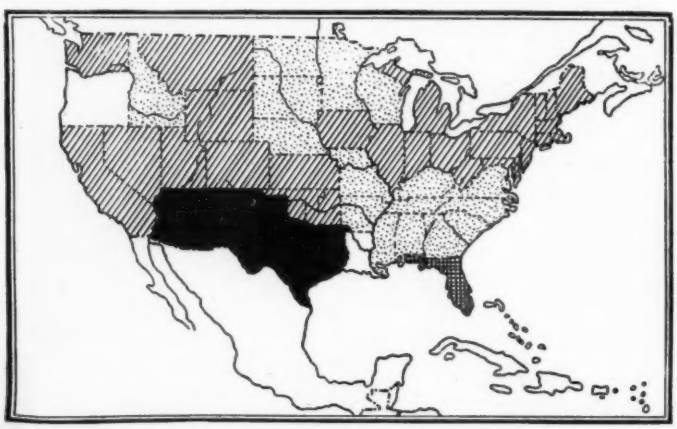
MAP 18

CENTRAL EUROPEAN TYPE

Rank:

- *First*
- *Second*
- *Third*
- *Fourth*





MAP 19

SOUTH EUROPEAN TYPE

Rank:

- *First*
- *Second*
- *Third*
- *Fourth*

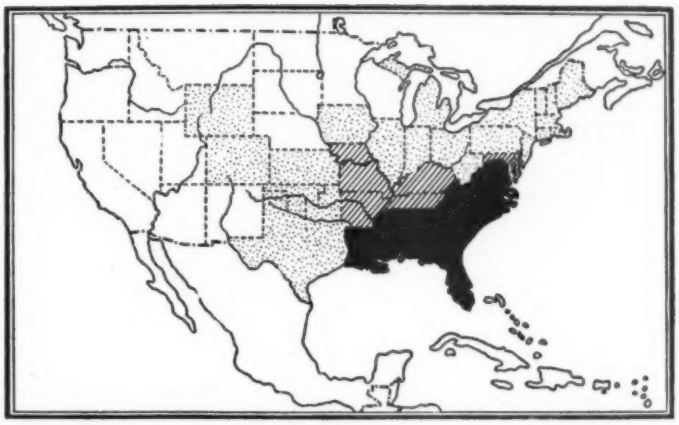
The North European type is still the most important element in our population. It will be noted that it is concentrated in the northeast and northwest. Second in importance is the Central European type, ranking first in the north central and Atlantic states. The South European type is fourth in importance at the present time. In a very general way there is some correspondence with the distribution of these racial types in Europe

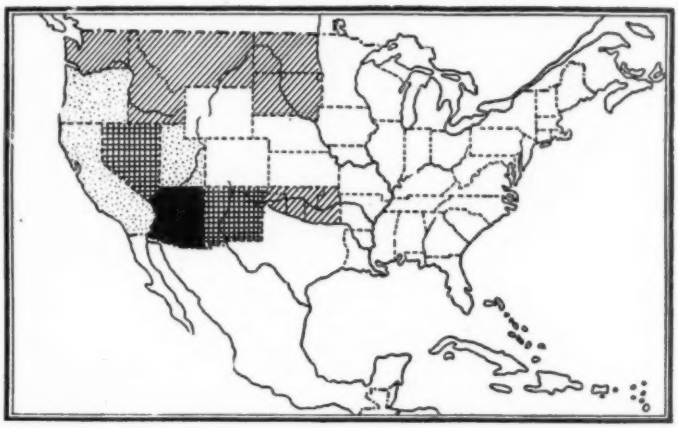
MAP 20

NEGRO TYPES

Rank:

- *First*
- *Third*
- *Fourth*





MAP 21

INDIAN TYPES

Per Cent of Total Population:

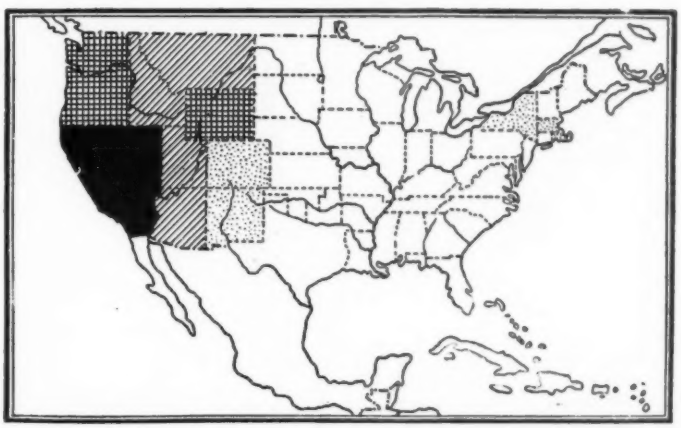
- 10+
- 5 – 10
- 1 – 5
- ½ – 1
- – ½

MAP 22

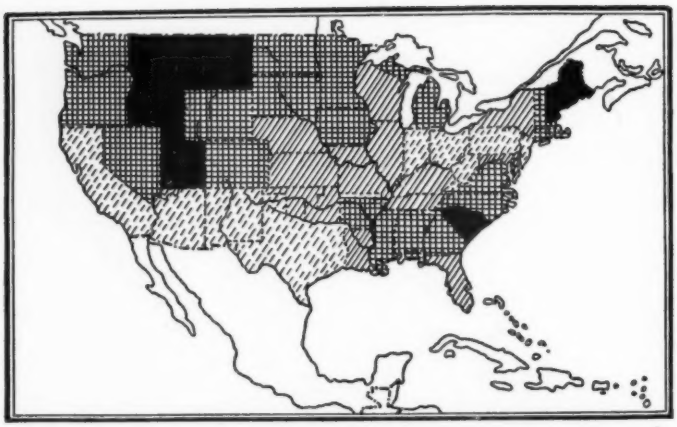
MONGOLOID TYPES

Per Cent of Total Population:

- 2+
- 1 – 2
- ½ – 1
- 1/10 – ½
- – 1/10

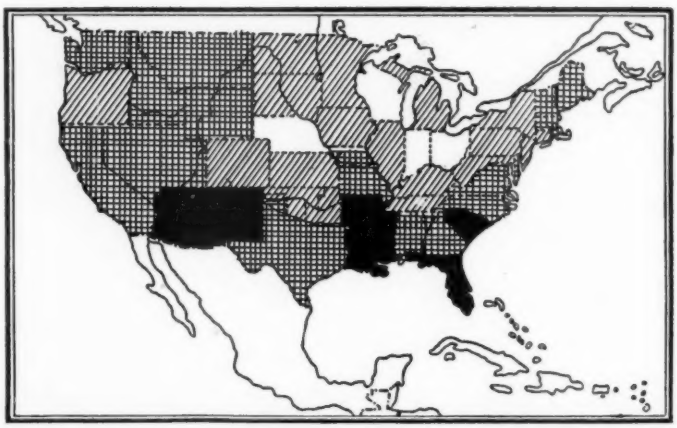


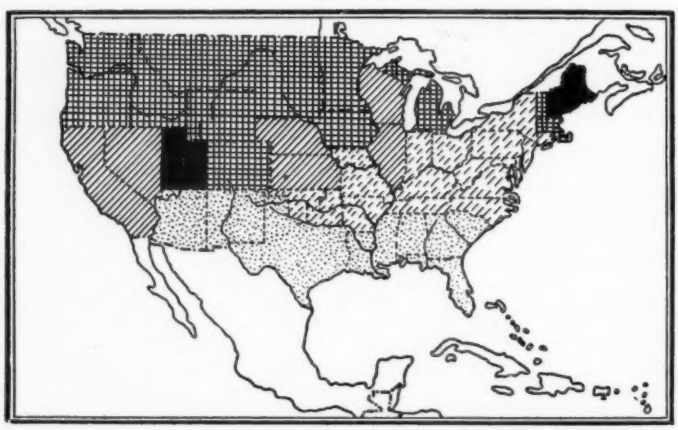
The Negro types are third in rank in the United States forming 11 per cent of our total population. The American Indians form only 3/10 of 1 per cent of our population. The Mongoloid types including Japanese, Chinese, Koreans, and Filipinos also constitute 3/10 of 1 per cent of the population of the United States



MAP 23
STATURE
Estimated Averages:
67½ inches
67 "
66½ "
66 "

MAP 24
CEPHALIC INDEX
Estimated Averages:
76 – 77
78 – 79
80 – 81
82 – 83





MAP 25
BLONDNESS
Estimated Percentage:
50 +
40 – 50
30 – 40
20 – 30
10 – 20

Estimated approximate distribution of the three most studied characteristics of race: stature, head form and pigmentation. While the figures given are not based on actual observations and are not intended to imply absolute accuracy, nevertheless they are undoubtedly correct so far as they show the general trend and distribution of these characters **(see footnote opposite page)**

Especially since this country entered the great world conflict, statements have appeared from time to time claiming a greater amount of valor and courage or number of enlistments for this or that racial type. While such a condition is entirely conceivable it is an absolute certainty that no concrete data have as yet been brought forward to uphold these contentions. Before making any such statement we must take into consideration just such facts as I have tried to bring out in this survey.

Were we to go into a military training camp in the northwestern states or in New England and be impressed with the high frequency of individuals of North European origin, we should not infer from this that the North European type is the more courageous. It is just what we should expect from the composition of the population. Nor would it be fair to the other racial types to estimate the courage of the Negro race by the proportion of Negroes enrolled in South Carolina, the South European type by the proportion of individuals of this type enrolled in Texas, or the Central European type by the proportion of its representatives enrolled in Indiana. Further than this, the social and economic status of the various types must be weighed before any generalization on relative courage or valor can be scientifically made.

Variation in Height, Cephalic Index, and Frequency of Blond and Brunette Types in Different Parts of the United States

It may also be of interest to trace the distribution in the United States of some of the racial characters we have mentioned. This can be approximated more accurately than the proportion of racial types. Here as before we cannot take into account the selection exercised by migration.

Considering first stature, we shall proceed as before and weigh the average stature of a national group by the relative importance of that nationality in each state. By taking the average for the first twelve nationalities in each state we can get some idea of the average stature in each state. Here too we must include the Indian, Negro, and Mongoloid types. As nearly as it can be estimated it seems that the average stature of the different states does not vary more than about two inches. The northwestern, New England, and southeastern states have the higher averages and the southwestern and north central states rather lower. The Negroes help raise the average in the southeastern states.

There are also considerable data on head form in the different European and other nationalities. Head form is

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Footnote (see maps on opposite page).—

Map 23 was compiled by giving the average stature of the various European nationalities a weight in accord with the relative numerical importance of each nationality in each state. There is a range of only about 2 inches in the averages of the various states. When we consider the range of stature for mankind as a whole it will be recognized that the inhabitants of the United States are a rather tall people. There seem to be three centers of very high stature which gradually merge into a region of shorter stature that extends obliquely across the country from southwest to northeast

In map 24, also, the average cephalic indices of the various nationalities are weighted by their numerical importance in each state. Although we must expect to find the entire range of head form well represented in the United States, the averages are not very different. The longer-headed peoples (with the smaller indices) seem to be concentrated along the east and west coasts and along the southern border. The longer heads in the south are in part due to the relatively high frequency of Negro and southern European types. The large central area presents a greater number of short-headed individuals and a higher average cephalic index

Degree of pigmentation is a racial character. Map 25 aims to show the approximate percentage and distribution of blondness, or a slight degree of pigmentation, in the United States. In this map "blondness" includes not only those individuals popularly known as blonds but also those that are scientifically known as dark and mixed blonds. The criteria are the color of hair and eyes. Since there seems to be a correlation between pigmentation in all parts of the body these criteria are consistent. Individuals having blond hair more frequently have blue or gray eyes. Again the large number of Negroes and southern Europeans in the south accounts for the darker pigmentation in that region

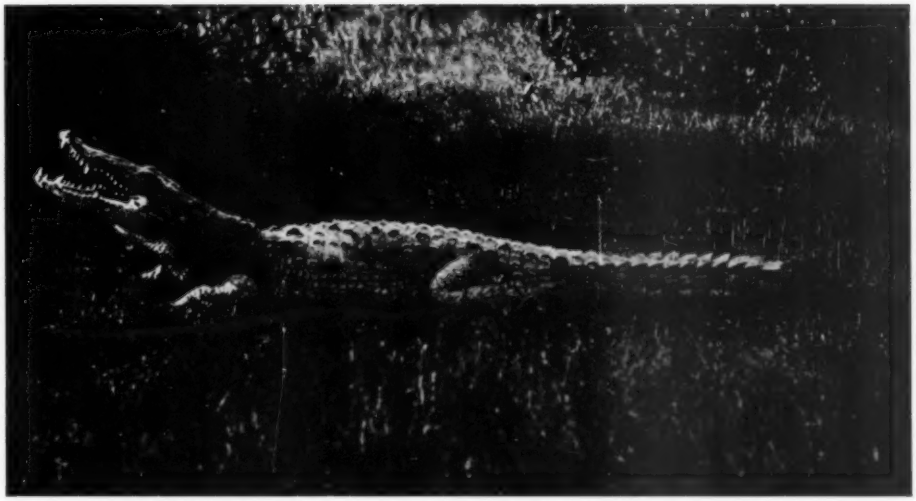
expressed by the cephalic index. The cephalic index expresses the proportion of the width of the head to the length of the head in terms of percentage. A small index denotes a relatively long head and a large index denotes one in which the width and length are more nearly equal and hence relatively short. This index ranges from 60 to 95. In the United States we have a great variety of head forms but the averages for the various states are probably not very different. The range of these averages is approximately from 76 to 83. The longer heads are more numerous in the south, northwest and New England states while shorter heads predominate in the north central states.

The only other character on which we have sufficient data to base an estimate is the relative frequency of blond and brunette types. A high percentage of blond types indicates a higher percentage of individuals belonging to the North European racial type. While the various percentages plotted on map 25 are not intended to denote accuracy they must show the relative frequency of blondness in the different states. By blondness we include those individuals popularly called blonds and others having blue or mixed eyes and light brown hair. From the map it is apparent that blond types are much more numerous in the northwest and New England than elsewhere. The high percentage of Negroes in the south accounts in part for the relative scarcity of blond types in that region.

Action of the "Melting Pot" Slow

We have seen, then, that a consideration of our population both as national groups and as racial types exhibiting certain peculiarities of physical make-up shows them to be distributed in a more or less orderly fashion. While we do have the most diverse physical types living side by side, one or the other of these types is usually far more numerous. The greatest amount of intermarriage is between individuals of the same national or racial type. This statement is fully substantiated by our census reports. The more diverse two types are nationally and physically the less frequent are intermarriages between these groups. It is probably only after several generations of a type have lived in this country that many of the national barriers are broken down and free intermixture takes place. In the case of some groups of very diverse physical type it is probable that these barriers never will be wholly removed. So then we should not expect too much of the "Melting Pot."

We are having repeated in this country in a somewhat more intense form the same processes that have been going on in Europe and other parts of the world for centuries. Many of nature's own biological experiments of the past are lost to us. We in this country have the unusual opportunity of seeing some of these experiments repeated before our own eyes. It is our duty to observe carefully and record the results of these experiments. It is only in this way that we can hope to throw any light on the past and future history of the various racial types of mankind. This survey aims only to indicate a very few of the many interesting results a careful anthropometric survey of our country might reveal.



This photograph, taken on August 11, 1889, is believed to be the first ever taken of a living Florida crocodile, *Crocodylus acutus* Cuvier. A few days later I shot what I thought the record specimen, 14 feet 2 inches long (it was sent to Yale University), but discovered many years afterward that in 1875, fourteen years previous, Dr. William T. Hornaday, director of the New York Zoölogical Park, had shot a specimen of just the same size. In later years I often visited the Florida crocodiles and found great sport in photographing them. It was a matter of ethics that a crocodile should be free at the time his picture was taken. This species of crocodile is found not only in southern Florida, but also through the Greater Antilles (except Porto Rico), Mexico, and along both coasts of Central America to Ecuador and Colombia

The Florida Crocodile

By A. W. DIMOCK[1]

With illustrations from photographs by the Author and his son, Julian A. Dimock

THAT the authors of dictionaries were supermen I always believed until I began to make the acquaintance of lexicographers and learned that scissors and paste did most of the authoring.

So in other lines, it is usually impossible really to tree an originator, or even a discoverer, of anything. Leverrier's discovery of Neptune was accounted the crowning triumph of human reasoning, but Adams antedated him by months, and many workers had lifted the science of astronomy to a plane which made the discovery inevitable. Amerigo Vespucci gave his name to the new world which Columbus discovered. I have even originated patentable ideas myself, only to find in the Patent Office the evidence that from one to a dozen or a hundred people had originated the same thing.

In exploiting some of the creatures of the wild, I have never been a pioneer; always the trail had been blazed, usually by some one who was pursuing his avocation with a singleness of purpose that left no room for thought of the distinction of discovery.

Uncle Remus' naming of the toad dis-

Mr. A. W. Dimock, member of the Authors Club, New York, and of the Camp Fire Club of America, is the author of *Florida Enchantments, Wall Street and the Wilds*, and other books and articles setting forth the natural beauties of Florida and other parts of the southeastern United States and the fascination of the region for the sportsman. His writings are illustrated by large series of photographs taken by Mr. Dimock and his son, Julian A. Dimock.

[1] September 11 brought the announcement of the sudden death of Mr. Dimock at his home at Peekamose, New York.

closed a typical method of discovery. The creature looked like a toad and jumped like a toad, so he called him a toad. But my preamble threatens to be longer than my little story.

During twenty-two annual cruises on the Gulf coast of Florida, I have exploded a few local myths regarding monsters of fabulous ferocity and unknown creatures which proved to be well known to scientists. My pursuit of the manatee was vain for so long that my attitude became that of the countryman toward the giraffe, "There ain't no sich animile," but I finally found the sea cow, some scores of him, or her, and made the acquaintance of their families, capturing specimens ranging from two hundred to two thousand pounds in weight and finally landing a couple of them alive in the New York Aquarium.

It was the ninth year of my hunting and cruising in Florida when I discovered a guide who could have qualified as of that western type known as "half horse and half alligator." We were in the Big Cypress, traveling light, relying upon the ground for our bed and a tropical thicket for our tent. We carried corn meal, coffee, and salt and my rifle added venison, wild turkey, and alligator to our bill of fare.

Our first camp was a dry one and I was dying of thirst, but my guide was cheerful, saying, "Plenty of water, just find an alligator hole," which we soon did, but the owner was at home and his hole a close fit for him. We worried him with sticks until he came outside, when I shot him, but as we drank our coffee I tried to think of pleasanter subjects.

I was a crank on the subject of wild life photography, an industry in which I have reason to think I was a pioneer, and my guide had promised to show me more alligators than I could "shake a stick at." He fulfilled his promise the next day when, through an opening in the jungle, I looked upon a pond a hundred yards in diameter, the surface of which was almost literally covered with the reptiles whose eyes were all turned upon me. After fixing and focusing I drew the slide of the camera and, taking the bulb between my teeth, sent a bullet through the brain of the nearest alligator, pressing the bulb as he threw himself half out of water. The prints from this plate show the wounded reptile partly in the air and seventy-three live alligators on the surface of the water.

That night as we lay on the ground where the smoke from the camp fire, drifting over us, made a barrage against the mosquitoes, Hall told me of strange monsters he had seen, which were *like* alligators but were *not* alligators. They had pointed jaws, long tusks, were larger and livelier, and were not black like 'gators. He had seen them farther from shore than alligators were ever met and he was sure he could find them again.

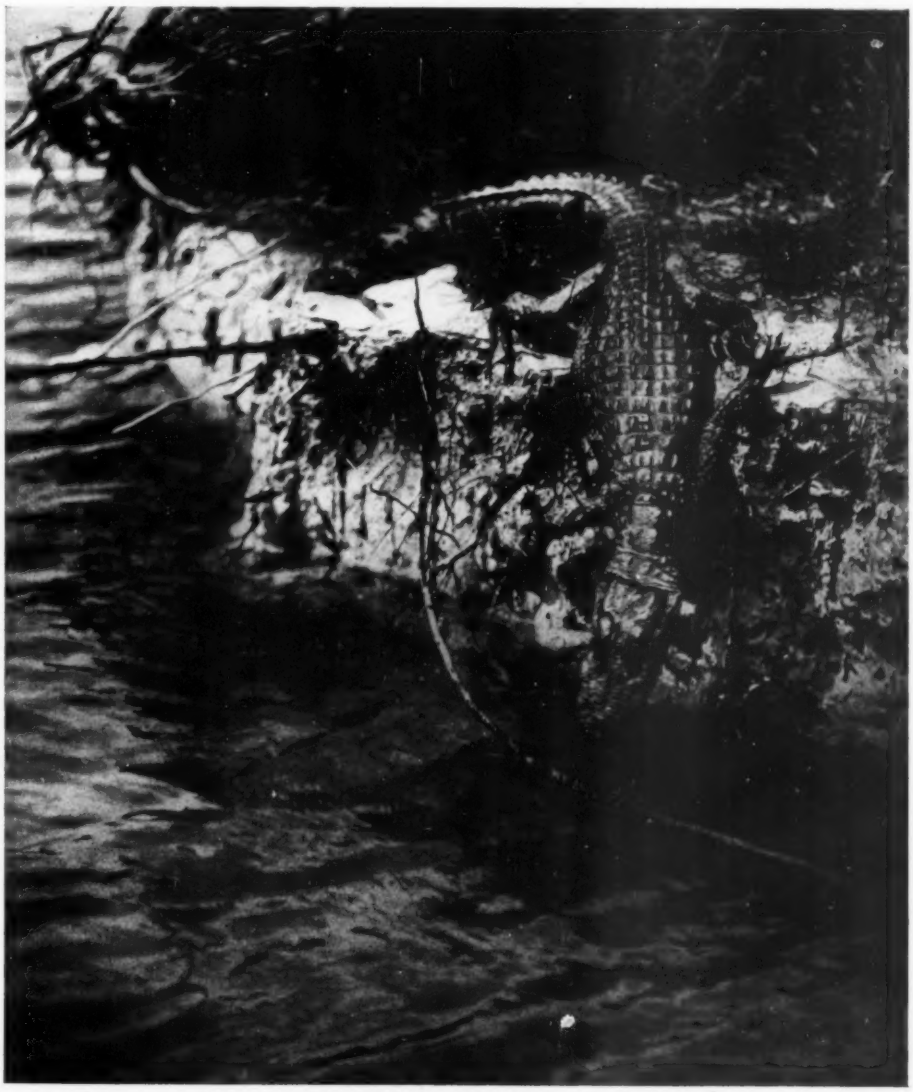
We planned to go in search of the creatures the following year, but it was two years before we met and then he had just taken Dr. Veile on the cruise which we had planned. But that was as near being a discoverer as I ever expected to get, so I went on the hunt with Hall just as we had proposed two years before.

One night we anchored a mile or two off Madeira Hammock in Barnes Sound, and in the early morning one of the creatures we were seeking was seen swimming near the "Sunrise," my schooner. Hall and I chased it in a skiff until he was worn out while the quarry was still fresh. I got one shot with the harpoon, but it was a case of projectile *versus* armor and the latter won.

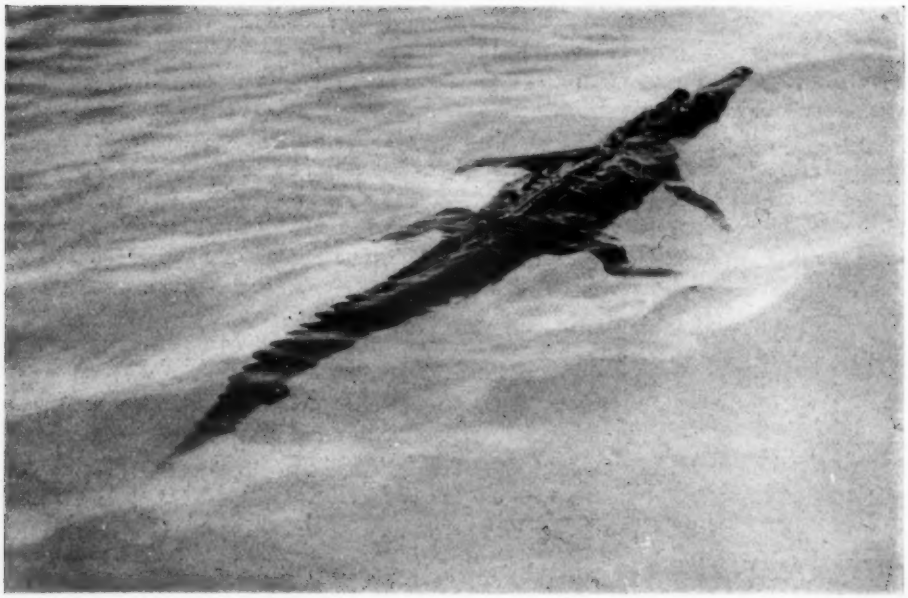
In the days that followed, my son Julian and I, with guide and boatman, pursued the reptiles in skiffs, through narrow bayous, over wide waters and up creeks so overhung with rank vegetation and tangled vines that we could

not sit upright in our boats. We caught a number of crocodiles from seven to ten feet in length which we round-skinned for mounting by the institutions to which I gave them. On April 11, 1889, I struck four, of which two escaped, and of one of the others I took what is believed to be the first photograph ever taken of a living Florida crocodile. My journal records that on the following day we had crocodile eggs and steak for breakfast.

The chief excitement of the cruise came a few days later when we encountered the largest crocodile I have ever seen. The story of this adventure has



The alligator, *Alligator mississippiensis* (Daudin), has a broad rounded muzzle which at once distinguishes it from the crocodile with its narrow pointed head. The alligator of the Western Hemisphere (there is a single species in China also) inhabits the rivers and swamps of northern South Carolina, of Georgia and Florida, and westward through Mississippi and Louisiana to the Rio Grande in Texas. The teeth in the upper jaw overlap more or less those below; the large tooth fourth from the front on the lower jaw fits into a deep pit in the jaw above

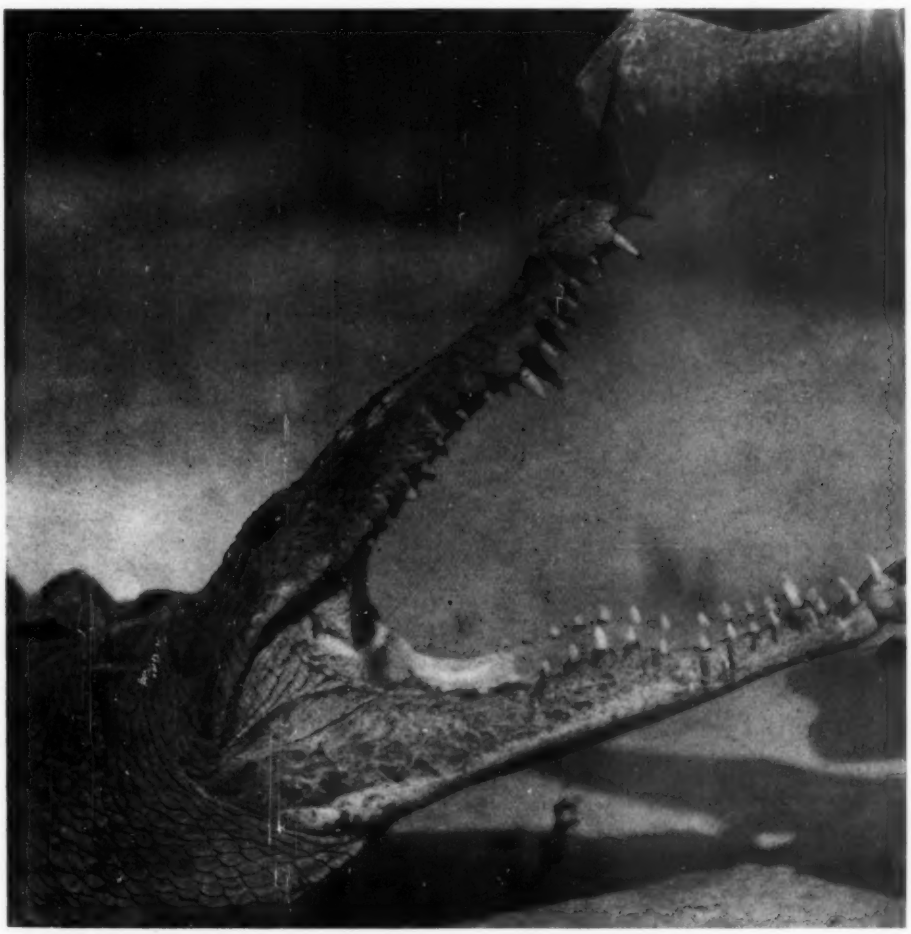


Early one morning, when we were anchored about one mile off Madeira Hammock in Barnes Sound, we saw a crocodile swimming near the schooner. We chased the creature with a skiff and got one shot with the harpoon, but it was a case of projectile *versus* armor and the armor won

A Florida crocodile on the schooner bound for New York.—This is one of the pair of specimens caught in the Madeira Hammock and sent alive to the New York Zoölogical Park, March 1, 1906

been told elsewhere, so I will merely summarize it here. We had corralled the creature in a deep but narrow channel the ends of which were guarded by our two skiffs, Julian's and mine. He got the first shot with his harpoon, which soon pulled out, having failed to penetrate the hide beyond the barb. The second shot was mine and the harpoon held, but the iron was so small and its barb so short that I dared put little strain upon it, yet it enabled us to follow and find the big saurian however muddy and deep were the holes where she tried to hide.

The hope came to me then of taking her alive but I lacked the experience which I accumulated in later years and was worsted in a contest of some hours which left, on our side, one boat out of commission and the other damaged, and a fighting mad crocodile on the other. That I resorted to my rifle was my admission of defeat. But at least I had killed the record Florida crocodile, of that I could be sure.



The Florida crocodile is a more vigorous fighter than the alligator, but after several vain attempts to escape from a lasso he may become discouraged and tamely allow his jaws to be held open while his photograph is taken. The teeth of the crocodile are somewhat longer than those of the alligator, and more or less interlock, some of those in the lower jaw fitting into pits in the upper jaw, but the long tooth fourth from the front on each side of the lower jaw fits into a notch on the outside of the upper jaw and is thus never hidden from view

I sent the skin to Professor Marsh of Yale College, who wrote me that it was a noble specimen and, making due allowance for the end of her tail which had been bitten off, was fourteen feet two inches long. It was many years later that I learned that my friend, Dr. Hornaday, had not only killed one of the creatures in 1875, thus beating me by fourteen years, but that his was fourteen feet two inches long without making any allowance for an amputated tail. Anyhow mine was a female which ought to count for something.

In the years that followed I frequently visited the little colony of Florida crocodiles which seemed definitely limited to a region at the extreme southern end of the peninsula of Florida, a strip about ten miles long by three wide. Saurians were plentiful in this part of the world but, outside of the limits named, all were alligators, none of which did I ever discover within them. I had specimens enough of the creatures and I never did kill them for sport, but my son and I found ways of making them contribute to our amusement. It was really exciting, after locating the mouth of a crocodile's cave in the bank of a river, to hang the noosed end of a rope before it, while standing on the bank above. As I waited for a bite, my boatman busied himself thrusting a harpoon pole into the earth from ten to twenty feet behind me. This was followed by the outrushing crocodile and some excitement at my end of the line. The big reptile struggled and fought, he clutched at the line and rolled over and over, he swam out in the stream and he sulked in its depths, but the noose was tightly drawn and never allowed to slip, and the end found the creature facing the camera on the bank. It was a matter of ethics that the crocodile should be free when his photograph was taken, and removing the lasso called for much agility on the part of the volunteer. After a few vain attempts to escape, a crocodile would become discouraged, and our hunter boy would hold open the jaws of a very much alive reptile while the camera-man photographed them.

As compared with their alligator congeners, the Florida crocodile is the more combative as evidenced by the larger proportion of mutilated members of that family. Of the thousand alligators which in my unregenerate days I killed, a very small percentage were battle-marked, while among the comparatively few crocodiles which were my victims the number of mutilated ones was surprisingly large.

It was not until 1906, just seventeen years after my introduction to the Florida crocodile, that I carried out my project of sending some living specimens to New York, and on March 1 of that year I sent from Key West to the New York "Zoo" a pair of the creatures which I had captured in the Madeira Hammock.

From the fact that I often found the Florida crocodile far out from land where the alligator was never seen, I inferred that he was of an exploring species, which, coming from the West Indies, had established a colony at Cape Sable with a view to the conquest of the country. It was therefore with much interest that last year, while cruising with Commodore Benedict in his "Oneida," I heard at Trinidad that a river near by abounded in "alligators." Happily there was in the party a man younger than I by enough scores of years to permit of carrying a rifle under a tropical sun while wallowing through waist-deep mud, and he brought home as the result of an arduous day four specimens of the Trinidad "alligator" which were identical in species with my Florida crocodiles of twenty-eight years before.

Islands[1]

By WILLIAM BEEBE

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WITH thrice seven-league boots one could stride from the coast of the United States and with a dozen steps reach British Guiana dry-shod. From an aviator's seat, the chain of West Indies, Windward, and Leeward islands curves gracefully southward, like stepping-stones across a Japanese stream. If, corresponding to this annihilation of space, we could abbreviate minutes, hours, and days as in a moving picture film, we might have the edifying spectacle of our steamer's trip reduced to a succession of loops, ricocheting from island after island, as a stone skips along the surface of the water, sliding along those dotted lines which are so characteristic a feature of coasts in our school geographies, and coming to rest at last with a splash in the muddy current off the Georgetown stelling.

Our steamer is preferable to the seven-league trip, for we thereby omit the big, cumbersome West Indies. It is a curious fact that any land projecting above the surface of the water is interesting and exciting in inverse ratio to its size. The endless New Jersey shore moves one not at all, while the single volcanic cone of Nevis brings thrills and emotions; Cuba is wearisome as one steams slowly past headland after headland, while Sombrero—a veritable oceanic speck of dust—stimulates the imagination to the highest pitch. It seems as if our ego enlarges as our immediate terrestrial cosmos diminishes. In studying the birds of the endless jungles of the South American continent my interest never flags, yet it never quite attains the *n*th power of enthusiasm which accompanies the thought of the possibility of locating every nest on St. Thomas. This love of small islands must savor of the joy of possible completeness in achievement, plus a king's sensations, plus some of those of Adam!

Any guidebook will give the area, population, amusements, best hotels (or the least objectionable ones), summary of history, and the more important exports. But no one has ever attempted to tell of the soul of these islands—or even of the individuality of each, which is very real and very distinct. Some day this will be done, and the telling will be very wonderful, and will use up most of the superlatives in our language. For my part I may only search my memory for some little unimportant scenes which live again when the name of the island is spoken—and string these at random on pages, like the chains of little scarlet and black sea beans which glisten in the fingers of the negresses, held up in hope of sale from their leaky boats, rocking on the liquid emerald around the steamer.

St. Thomas, or How I Was Taught to Catch Lizards by a Danish "Flapper"

Nearly a week had passed since we began to exchange a sleety winter for the velvety tropics, to traverse the latitude spectrum of ocean from drab-gray to living turquoise. As on every trip, it was early morning when the long undulating profile of St. Thomas reared itself lazily from the sea, and almost at once flocks of great-winged booby gannets began to wheel and veer around the ship, banking in a way to make an aviator's blood leap.

From a dusky monochrome the land

[1] This preliminary publication of the third chapter of *Jungle Peace*, soon to appear from the press of Henry Holt & Co., is granted through the courtesy of the Author and publishers.

resolved into shades, and slowly into colors—gray volcanic rocks, dry yellow turf, and green patches of trees. Then contours became traceable, smooth rounded shoulders of hills frayed out into jagged strata, with the close-shaven fur of bushes and shrubs, and occasional tall slender palms reminding one of single hydroids on the sargasso fronds. A thread of smoke drifting free from a palm grove was the first sign of life, and after a few minutes of twisting and turning, the steamer nosed out her circuitous channel, and from the very heart of the island the great crater harbor opened before us.

The beautiful hills rolled up and upward, and to their feet Charlotte Amalie, crowned with Bluebeard's castle, clung obliquely, her streets climbing with astonishing steepness. The little town was newly roofed, all the picturesque old red ones having been ripped off in the last hurricane. The houses were as flat, quite as like cardboard theatrical scenery, as ever.

At the sight of a distant flag I endeavored to thrill patriotically at the thought that this island was now a part of the United States. I would have been more successful, however, if I could have recalled the vision of some fellow countryman in far distant time, landing on these slopes and taking possession by right of discovery. Even if some burly, semipiratical American adventurer had annexed it for his president by feat of arms, my blood would have flowed less calmly than it did at the thought of so many millions of dollars paid as *droit de possession*. However, a tropic bird flew past and put the matter out of mind.

As always, near the wharf thrived the same little open barroom, with its floral-bedecked mirrors, selling good beer and vile soda. Aside from a flag here and there, the only sign of the change of nationality was several motorcycles with side cars which American soldiers drove like Jehu through the narrow streets, hustling natives and their tiny carts and ponies to one side, and leaving enduring trains of gasoline-scented dust. A few minutes' walk up one of the steep streets and all was quiet and unhurried, and the sense of a yet undigested possession, of embarrassing novelty of purchase, slipped aside and we knew that St. Thomas was still the unspoiled little island which the slow mellowing growth of West Indian evolution had made it. We climbed slowly up the steep road toward Mafolie, and behind us the glory of this wonderful island unfolded and spread, the roofs of the town shifting into strange geometric figures, and the harbor circle widening. We passed negroes and pleasant sunburned Danes driving tiny burros laden with small fagots and with grass. At one turn a tamarind tree was in full blossom, and here were gathered all the humming birds and butterflies of the island—or so it seemed. At last we reached a ravine, dry as everything else at this season on the island, and walked slowly up it, catching butterflies. They were in great numbers and gayly colored. The strangest sight was hundreds of large, brown millipedes clinging to the stems of bushes and small trees, apparently finding more moisture in the steady trade winds than in the soil, which even under large stones, was parched and dry; dragon flies were abundant, but the dominant forms were butterflies and spiders.

The road wound over the top of the ridge, and from its summit we looked down on the other half of the island. No house or trace of cultivation was visible and the beauty of the view was beyond adequate description. Rolling, comfortably undulating hills were below us, and in front a taller, rounded one like the head of some wearied tropical giant. Beyond this, a long curved arm of richest green had been stretched carelessly out into the sea, inclosing a bay which, from our height, looked like a small pool, but such a pool as would

grace a Dunsany tale. It was limpid, its surface like glass and of the most exquisite turquoise. Its inner rim was of pure white sand, a winding line bounding turquoise water and the rich, dark green of the sloping land in a flattened figure three. I never knew before that turquoise had a hundred tints and shades, but here the film nearest the sand was unbelievably pale and translucent, then a deeper sheen overlaid the surface, while the center of the pool was shaded with the indescribable pigment of sheer depth. In a great frame of shifting emerald and cobalt, set a shining blue wing of a *Morpho* butterfly, and you can visualize this wonder scene.

Outside the encircling green arm, the water of ocean glowed ultramarine in the slanting sunlight, and stretched on and on to the curving horizon of Atlantis. The scene seemed the essence of peace, and to the casual glance hardly a cloud moved. I sat for a long time and let every part of my retina absorb the glory of colors. Soon motion and life became apparent. Shadows shifted softly across the surface, bringing hues of delicate purplish blue, memory tints of open ocean, and against these darkened tones a thousand specks of white glowed and interweaved like a maze of motes in a shaft of sunlight. In imagination we could enlarge them to a swarm of silvery bees, and then my glasses resolved them into gannets—great sea birds with wings six feet from tip to tip—an astounding hint of the actual distance and depth below me of this pool-like bay. An hour later the sunlight left the turquoise surface, and its blueness darkened and strengthened and became opaque, although it was a long time before sunset, and the ocean beyond kept all its brilliance.

My eye was drawn to two tiny dots on the sandy rim. I could just make out that they were moving and guessed them to be dogs or chickens. The glasses made magic again and split up each group into a triumvirate of little burros which trotted along, and presently turned into an invisible side trail.

Perhaps the most fascinating discovery of motion was that of the water's edge. To the eye there were neither waves nor ripples, but careful scrutiny through the strong prisms showed a rhythmical approach and receding, a gentle breathlike pulsation which regularly darkened and uncovered a thread of sand. I forgot the busy little town on the other side of the island, the commerce and coaling and the distant echo of war, and giving a last look at the tarnished turquoise pool, the resentment of financial acquisition of such beauty softened, and I felt glad that I had indirectly some small tithe of ownership, as well as the complete memory monopoly of the glories of this passing day.

As I made my way down the ravine, the fascinating island lizards scrambled about or watched me knowingly from rock or tree trunk. As usual I wrecked my net in striving to sweep them into it, and bruised my fingers in vain efforts to seize their slender forms. Rarely I succeeded; usually I found but a bit of tail in my fingers, or a handful of loose bark, while, just out of reach, the lizards would halt and look me over derisively with their bright intelligent eyes.

At the roadside I came suddenly upon a little Danish girl of about twelve years, dancing excitedly with a lizard dangling from the end of a slender grass stem. Her blue eyes flashed with excitement, her yellow pigtail flew wildly about as she danced and backed away, fearful of touching the little lizard, and yet too fascinated to drop it and allow it to escape. I took it up and found it had been captured with a neat slip noose. She said it was easy to catch them and showed me how, and before I reached the wharf I had a dozen of

the interesting little chaps stored in various pockets. Thus after my years of effort a little Danish school girl solved the problem for me. Acting on this hint I tried fine hair wire, but nothing proved as effective as the thin, pliant but strong stems of grass.

It is surprising how difficult it is to touch these little reptiles and yet how easy to noose them. At the approach of hand or net they are off faster than the eye can follow, but the waving grass merely interests them. Even when by an awkward motion one flicks their nose, they merely shake the head or shift a step or two. They detect no connection between the moving grass and the more distant hand that wields it.

Bound to the ground by their short scales and four limbs, these small lizards are yet remarkably birdlike in their vivacity and their enthusiastic playing of their little game of life. Every motion is registered by quick wrenlike movements and by the changing play of colors over their scales, while when particularly excited, they puff out a comical dewlap of yellow and orange skin beneath the throat. Thanks to my "flapper" acquaintance I am now on more equal terms with the little scaly people of the islands, and can study their puzzling color problems at close range.

Looking back at Bluebeard's and Blackbeard's castles from the deck of our vessel as we slowly steamed from the harbor, some one asked when the last pirate plied his trade. I looked ashore at the fort and guns, I listened to the warning bugle, I watched the scattered lights vanish, leaving all of the town in darkness, I saw our own darkened portholes and shaded lights. As my mind went to the submarines which inspired all these precautions, as I recalled the sinister swirl in the Atlantic which had threatened us more than once on my return from the battle front, I could answer truly that Bluebeard and his ilk were worthily represented at the present day. Indeed, of the two enemies, I found much more to condone in the ignorance and the frank, primitive brutality of the pirate of past centuries, than in the prostituted science and camouflaged *Kultur* of the Teutonic Ishmaelite of today.

St. Kitts, a Plunge, Exploration, and Monkeys

I came on deck at daybreak and found the sea like a mirror. Even the clouds were undisturbed, resting quietly in the mountain valleys of St. Eustatius, and on the upper slopes of St. Kitts in the distance. The tropical morning was a lazy one, and the engines seemed to throb in a half-somnolent manner. I folded up into a deck chair and idly watched the beautiful profile of the island astern.

Suddenly the sea became alive with virile beings—curving steel-gray bodies which shot forth like torpedoes from some mighty battery. I thrilled in every fiber and the sloth of the tropics fell from me as if by a galvanic shock: the dolphins had come! Usually they appear in their haunts between Dominica and Martinique or off the latter island, but here they were in dozens, leaping for breath with the regularity of machinery. Now and then the spirit of play would possess one and he vaulted high in air, ten feet above the surface, twisted and fell broadside with a slap which could be heard a half mile away. Then several simultaneously did the same thing. A school would come close alongside, slacken speed to that of the vessel, and now and then dive beneath and appear off the opposite quarter. Another trick was for one or two to station themselves just ahead of the bow and remain motionless, urged on by the pressure of the water from behind. It was very unexpected and very splendid to have this battalion of magnificent cetaceans, bursting with vital energy and fullness of life, injected without warn-

ing into the calm quiet of this tropical sea.

We anchored off Basseterre and waited in vain for the doctor. There seemed no chance of landing for some time, so several of us dived off and swam about the ship for an hour. The joy of this tropical water is something which can be communicated only by experience. It was so transparent that in diving one hardly knew the moment he would enter it. Paddling along just beneath the surface, there was a constant temptation to reach down and grasp the waving sea ferns and bits of coral which seemed only just out of reach, whereas they were a good thirty feet beneath. Whether floating idly or barging clumsily along in the only fashion possible to us terrestrial humans, we longed for the sinuous power of the dolphins, whose easy sculling imparts such astounding impetus. Now and then we saw a deep-swimming fish, but the line of envious fellow voyagers along the ship's rail were denied all this joy by reason of their fear of sharks. They had read in many books and they had listened to many tales, and they did not know what we shared with the little nigger boys who dive for pennies—the knowledge that the chance of an attack from a shark is about equal to that of having your ears sewed up by devil's darning needles. Over all the world I have swum among sharks; from Ceylon to the Spanish Main I have talked intimately with scores of native captains and sailors and learned the difference between what they tell to the credulous tourist and what they believe in their hearts.

In time the St. Kitts doctor arrived, and, as he rowed past, looked at us critically as if he suspected us of infecting the waters of the sea with some of those mysteriously terrible diseases which he is always hoping for on the ship's papers, but never seems to find.

Walking hastily through the town, we reached the first of the great sugar cane fields, and skirting these diagonally came ever nearer the sloping base of the high land. Ravines are always interesting for they cannot be cultivated, and it was up one of these lava and water-worn gullies that we began to climb Monkey Hill. We went slowly, for there were many absorbing things on the way. Palm swifts swooped about, while noisy kingbirds gleaned as industriously but with shorter flights. Heavy-billed anis *whaleeped* and fluttered clumsily ahead of us; honey creepers squeaked and small black finches watched us anxiously. From a marshy pool half a dozen migrating sandpipers flew up and circled down to the shore. Every shrubby field was alive with butterflies of many kinds and the vigorous shaking of each bush yielded excellent harvests of strange insects which fell into the open umbrella held beneath. In a grove of wild mango and acacias were hosts of green filigree butterflies, dropping and swirling from the foliage like falling leaves, the comparison being heightened by the brown spots, like fungus blotches, which were etched upon their wings.

Leaving the ravine we climbed over great lateral shoulders of the mountain, grassy slopes with bold outjutting rocks, and rarely a clump of small shrubs, bringing to mind the lower foothills of Garhwal and Kashmir. Higher still came a dense shrubby growth, much of it thorny, seamed by our narrow trail, and threaded here and there by glowing fronds of golden shower orchids. Ground doves perched on low branches and an occasional pigeon whistled past. From the summit a wonderful view stretched out—the long, sloping, green cane fields, the clustered roofs, and beyond the curving beaches the blue water with our vessel resting at anchor. Now came a search for monkeys, regardless of thorns and rough stones, for, strange though it sounds, St. Kitts possesses many of these animals. Whatever the accident of their

arrival, they are firmly established, and work much havoc in the small hours among gardens and sugar cane. Our efforts were in vain. We heard the scolding chatter of one of the small simians, and were preparing to surround him, when a warning blast from the ship summoned us and we packed up our collection of insects and flowers, munched our last piece of chocolate, and began to clamber down the great sun-drenched slopes.

Martinique, or a New Use for an Eight of Hearts

Columbus thought that this island was inhabited only by women, and to this day the market place bears out the idea. It is a place apart from all the rest of the city. In early morning, before the gaudy shutters were taken down, the streets were quiet—the callous soles of the passersby made the merest velvet shuffling and only an occasional cry of the vendor of some strange fruit or cakes broke the stillness. When the market was yet half a block away, one became aurally aware of it. The air was filled with a subdued hum, an indefinite murmur which might as well be the sound of tumbling waters as of human voices. It was a communal tongue, lacking individual words, accent, and grammar, and yet containing the essence of a hundred little arguments, soliloquies, pleadings, offers, and refusals. After the aural came the olfactory zone, and none may describe this, so intermingled that fish and vegetables, spice and onions were to be detected only when one approached their respective booths.

The details of market life hold the possibilities of epic description; the transactions of a stock exchange pale into mediocrity compared with the noise and excitement when a sixpence changes hands between Martinique negresses.

All the sales in the market were of the smallest quantities; little silver was seen, pennies, ha'pennies, and sous composing all the piles of coppers. The colors of the fruits were like flowers: melons white with a delicate fretwork of green; brilliant touches of red peppers like scarlet passion flowers; tiny bits of garlic, lilac-tinted. The fish had the hues of sunsets on their scales, and the most beautiful, the angel fishes, were three for a penny, while the uglier, more edible ones, were sixpence each. Beauty was rated at inverse value here.

Around and around the iron fence which bounded the market place, paced a pitiful pair—a tiny black mite who could not have passed three summers, leading an old blind woman by the hem of an ample black skirt. After several halting steps they would hesitate and the gaunt hand would be thrust through the bars begging for market refuse. Once the gods were kind and a bit of melon and a spotted mango were given, but more often alms was asked of an empty stall, or within sight only of a tethered duck or chicken. Some of the gifts were no better than the garbage over which the pair stepped.

We sat in chairs in a tiny pharmacist shop—the artist and I—and were at once the center of a chattering, staring throng, a kaleidoscope of shifting colors. We shoved and dismissed to no avail, then the owner of the shop with a gentle *"Permettez-moi"* threw a pailful of not-too-clean water over the crowd, including the artist and myself. The mob scattered shrieking and for a short time the surrounding space was open. Soon a larger crowd gathered, with the still dripping units of the first assemblage smiling expectantly in the offing, hovering at a safe distance. The second dispersal had a legal origin; the market policeman stole quietly along the wall of the shop and hurled himself like a catapult, butting goatlike into the heart of the crowd. A half dozen fat negresses toppled over,

and cassava, tin cups, and stray fishes flew about. Even those who lost all their purchases showed no resentment but only a roaring appreciation of the joke. In this rush we were almost upset with the crowd, and we began to look forward with dread to any more strenuous defense of our comfort.

The little French mulatto pharmacist who was responsible for the occasional joyful outbursts of *eau,* seemed to profit by our presence, for a number of interested onlookers who had pushed into the shop to watch us from behind, when cornered and hailed by the irate owner, stammeringly asked for some small thing, by the purchase of which they bought their liberty. The regular business of this little shop alone was worthy one's whole attention. A prescription was being pounded up in a mortar and when the clerk reached out for a scoop and for something to scrape the sides clean, an eight of hearts was the nearest and with this the chemicals were mixed. Within the next fifteen minutes eight or ten different prescriptions, powders and crystals, were measured, shaken, mixed and scraped by the same eight of hearts, and the combination of ingredients which the last purchaser obtained must surely have had some radical effect on his system—salubrious or otherwise.

Then came the unusual one—the super person who is always to be discovered sooner or later. Externally she was indistinguishable from the host of her sisters. She was garbed in a wrapper, flowing and reaching the ground, purple and pocked with large white spots. A diminutive turban of yellow and red madras was surmounted by an ancient and crownless straw hat, but at the first word she was revealed. A British subject, she had been here at the eruption of Mt. Pelée fifteen years before. That day she and one of her daughters happened to be far away from St. Pierre. When the explosion came, they were outside the danger zone, but her husband, son, and other daughter were burned to death. She regretted the impoliteness of the French here and apologized for them for crowding us. Later she brought a gift of rose bananas to the artist, saying that Americans had given her food and clothes when she lost everything.

The crowd was curious, thoughtless, selfish, with its dominant hope a laugh at some one's expense. Here was one who sought us out, who left unguarded her little tray of bananas and garlic to speak a word of thanks, to present a handful of fruit which in her station was a munificent gift, and who was satisfied with and grateful for our sincere appreciation. She has sisters in graciousness over all the world, but they are rare and widely scattered,—like the Akawai Indian squaw who gave me her last cassava, like the wrinkled Japanese crone who persuaded her son to become one of my best servants, like the wife of the headman of an isolated village in Yunnan, who from among her sodden, beastlike neighbors came forth and offered fowls and vegetables with a courteous spirit worthy of any station in life.

St. Lucia, a Study in Contrasts

Each time I have visited Castries it has seemed more somber and less pleasant. It is colorless because it is full of coal and no change of weather brings amelioration. When the sun fills the air with a blinding glare and palpitating heat waves (as it occasionally does), each step raises a cloud of coal dust, and when the tropical rain falls in a steady downpour (as it usually does), the whole world seems covered with coal mud, as if about to dissolve into some carboniferous slime.

Castries is an important military and coaling station, which perhaps explains much. Military exigency compelled me to procure a special pass from the Chief of Police to paddle about its

dreary streets, but it strictly forbade my climbing the comparatively clean and attractive mountains beyond these streets. As a coaling station I am sure of its success and popularity, for the coal carriers who comprise most of the natives, have apparently no time to wash between steamers. So intensive was the grime that the original dark hue of their skins offered no camouflage to the anthracite palimpsest which overlaid it. Such huge negro women, such muscles, such sense of power, I had never before realized. I should dislike, were I an official of St. Lucia, to take any decided stand on an antifeminine platform.

So saturated are the people in coal, such is their lack of proper perspective of this material, they seem actually to be unconscious of its presence. Returning on board, one passes the Seaview Hotel, about which coal is piled to a much greater height than the roof. Such abstraction is worthy of mention at least.

Amid the memory of all the dirt and damp, dull sadness, two things were unforgetable, as untouched diamonds glisten in their matrix of wet blue clay. Amid sodden clothes, unwashed hands, and bestial faces, a trayful of rainbow fishes gleamed opal-like —coral, parrot, and angel fish, all awaiting some unsavory purchaser. Then, out of the ruck of sexless bearers of coal, came the little French negress, selling fans. When we answered her appeal with a *"Non, merci,"* her face lighted up at the courtesy of the words; *"Voilà,"* said she, *"c'est bien refusé gracieusement."* No mortal could have resisted buying her wares after such delicate sentiment.

About five in the afternoon we parted from the gritty wharf and steamed for hour after hour along the shore. We forgot the coal carriers, and the thought of the misery and squalor of the town passed with its vanishing, still clad in its cloak of rain. As the natives appeared to us so inferior to those of the other islands, so by some law of compensation the coast was revealed correspondingly beautiful. At four bells the sun sank on the side away from the island, in a blaze of yellow and orange with one particular cloud touching the water line with flame color, as if a mighty distant volcano had just reared its head above the sea, still in the throes of molten erection. On the opposite side were passing the dark green headlands and fjords of the land, while upward, high into the sky, there arose now and then some tremendous cloud, on fire with rich rose or salmon afterglow, or a maze of other tints defying human name or pigment. In front was the living blue water dulled by the dimming light and above all the transparent blue of the tropic sky.

Without warning, from out of the soft folded edges of one of the filmy clouds, crept a curved edge of cold steel, like some strange kind of floating shell coming forth from its cloud of smoke, and a moment later the full moon was revealed, unlike any other color note in this marvelous scene. The icy, unchanging moon craters, the more plastic island mountains fringed by the wind-shapen trees, the still more shifting waters, and the evanescent cloud mist, all were played upon and saturated and stained by colors which were beyond words, almost beyond our appreciation.

Tiny villages, fronted by canoes and swathed in feathery cocoanut fronds, snuggled at the foot of great volcanic and coral cliffs. But the crowning glory was reserved for the last, when we surged past the *trois pitons*, rearing their majestic heads above all the island, hundreds and hundreds of feet into the sky. Even the moon could not top one, and after cutting into sharp, silver silhouette every leaf and branch of a moon-wide swath of trees, it buried itself behind the peak and framed the whole mountain.

A small wandering rain storm drifted against the tallest *piton* and split in two, one half going away down the coast and the rest passing close enough to us to shower the decks with drops. As it fell astern, it spread out fanwise and in its heart developed a ghostly lunar rainbow—the spectrum cleansed and denuded of all the garish colors of day. . . .

Once a faint light appeared upon the distant shore. Our steamer spoke in a short, sharp blast which thrilled us with its unexpectedness, and the signal among the palms was quenched. From the great things of the cosmos, from brilliant Venus, and from the North Star low in the sky, from the new splendor of Fomalhaut, rising ever higher in the south, our thoughts were forced back to the littlenesses of the World War, whose faint influence reached even thus far to break the thread of our abstraction.

Barbados, in Eclipse and in Sun

The vagaries of a naturalist are the delight of the uninitiated, and impress simple natives more than immoderate tips or the routine excesses of tourist folk. One's scientific eccentricities may even establish a small measure of fame, or rather notoriety. So it was that as I walked up the landing stage at Bridgetown, a small ebon personage pointed finger at me and confided to his neighbor, "See de mon—de tall mon da—he de mon who chase tree lizards in de cemetry!"

"Yes, George," I said, "I'm de mon who chased them with you two years ago, but this time we shall catch them as well."

"Anyting you say true, Boss, I'se yo boy."

But as is always true in sport, certainty robs it of the finest element of excitement, and our successful stalks that afternoon with grass stem nooses were less memorable than the frantic tree circlings and grave hurdlings of two years before.

On our return from the cemetery a breeze swept up from the sea, the palm fronds slithered against one another, and I suddenly caught myself shivering. The moment I became conscious of this I thought of fever and wondered if my lifelong immunity had come to an end. Then I observed old hags wrapping themselves up; my eyes suddenly readjusted, I perceived that the glaring sunlight was tempered; again the strange midday breeze arose, and finally I realized that I was witnessing an eclipse of the sun on the island of Barbados. The natives and the birds and even the patient little donkeys grew restless, the light became weaker and strange, and until the end of the eclipse we could think of nothing else. The most remarkable part to me was the reflections. Looking, however hastily and obliquely at the sun, I perceived nothing but a blinding glare, but walking beneath the shade of dense tropical foliage, the hosts of specks of sunlight sifting through, reflected on the white limestone, were in reality thousands of tiny representations of the sun's disk incised with the segment of the silhouetted moon, but reversed, just like the image through the aperture of a pinhole camera. I suppose it is a very common physical phenomenon, but to me it was a surprising thing to trace the curve of the eclipse clearly and with ease in the sunbeams on the pavement beneath my feet, while my retinas refused to face or register the original.

Barbados is very flat, thoroughly cultivated, and said to be the most densely populated bit of land in the world; all of which guidebook gossip was discouraging to a naturalist. But besides the cemetery which was sanctuary for the jolly little lizards, I found a bit of unspoilt beach, with sand as white and fine as talcum powder, where dwelt undisturbed many assemblages of small folk. There were land crabs which had come to have at heart more affection

for the vegetable gardens at the beach top than for the waters of their forefathers. They had degenerated into mere commuters from their holes to the nearest melon patch. The lower part of the beach was that ever-changing zone—that altar upon which each tide deposited some offering from the depths of the sea. This will some day have a worthy interpreter, a sympathetic recorder and commentator who will make a marvelous volume of this intermittent thread of the earth's surface, pulsing, changing—now showing as water, now as land—but always vital with exciting happenings.

I sat for an hour on the upper beach and watched the little native folk, autochthons which for innumerable generations had been so loyal to their arenaceous home that the sheltering mantle of its pale hue had fallen upon their wings and bodies. Here were tiny, grayish-white crabs, here were spiders, which, until they moved, were not spiders but sand. And when they did move, recognition usually came too late to some fly, which had trespassed on this littoral hunting ground. Tiger beetles drifted about like sand-grain wraiths, whose life wanderings lay between low tide and the highest dune, veriest ghosts of their brilliant green brethren farther inland. Ashen wasps buzzed past, with compass and maps in their heads, enabling them to circle about once or twice, alight, take a step or two and, kicking down their diminutive front door, enter the slanting sandy tube which for them fulfilled all the requirements of home.

From an aëroplane, Barbados would appear like a circular expanse of patchwork, or a wild futurist painting set in deepest ultramarine—a maze of rectangles or squares of sugar cane, with a scattering of sweet potatoes and sea island cotton. I got a hint of this when I motored to the highest point of land, and then climbed the steeple of the loftiest church. At my feet was the Atlantic with great breakers, reduced by distance to tiny wavelets twinkling among the black boulders and feathery palms scattered along shore. For more than two hundred and seventy-five years the church had stood here, and the graveyard, not to be outdone by the strangeness of the little beach people, boasted the remains of a descendant of a Greek emperor, who long ago had been warden.

But again our steamer summoned us and we left the dusky natives with their weird legends and the tiny island which they love, and were rowed steadily out beyond the two miles of shallow coast.

When we steamed away from shore that night, no lights except those of the dining saloon were allowed. Yet the path of the vessel made a mockery of this concealment. The world did not exist a hundred feet away from the ship and yet there was no mist or fog. The outward curve of the water from the bow was a long slender scimitar of phosphorescence, and from its cutting edge and tip flashed bits of flame and brilliant steely sparks, apparently suspended above the jet-black water. Alongside was a steady ribbon of dull green luminescence, while, rolling and drifting along through this path of light, came now and then great balls of clear, pure fire touched with emerald flames, some huge jellyfish, or fish perchance, or sargasso weed incrusted with *Noctiluca*. Everywhere within the narrow zone of visibility were flickering constellations, suns and planets of momentary life, dying within the second in which they flashed into sight. Once Orion left a distinct memory on the retina—instantly to die forever. Perhaps to some unimaginably distant and unknown god, our world system may appear as fleeting. To my eyes it seemed as if I looked at the reflections of constellations which no longer swung across the heavens—shadows of shadows.

Then four bells struck—silveryly—and I knew that time still existed.

BIRD LIFE OF SOUTH GEORGIA

Nine native species of birds of a subantarctic island twelve hundred miles east of Cape Horn—Portraits made during the South Georgia Expedition of the American Museum of Natural History and the Brooklyn Museum, 1912 and 1913

PHOTOGRAPHS AND ORIGINAL DATA BY ROBERT CUSHMAN MURPHY

A SOUTH GEORGIAN TERN AND ITS EGG

This small tern (*Sterna vittata georgiæ*) is unlike our northern representatives in that it lays but a single egg, often among the bare pebbles of the terminal moraines of glaciers. The egg or the chick is constantly covered by one of the parents, not only because of the prevailingly inclement weather, but also for fear of enemies which include cannibalistic members of its own species. During the almost daily summer snowstorms, the mother tern sometimes broods the egg or young so persistently that a visitor may touch her before she will abandon it. Photographed at Grace Glacier, Bay of Isles, January 24, 1913

The upland goose (*Chloëphaga magellanica*) was introduced into South Georgia from the Falkland Islands, where the species has been outlawed because it feeds upon grass and hence is supposed to compete with sheep. If it can gain a foothold in its new home, it will be assured of a sheepless future, for these animals cannot endure the South Georgian climate. The position of this pair of geese is characteristic, the white gander standing on the safe side of his barred mate with respect to the observer. Cumberland Bay, November 30, 1912

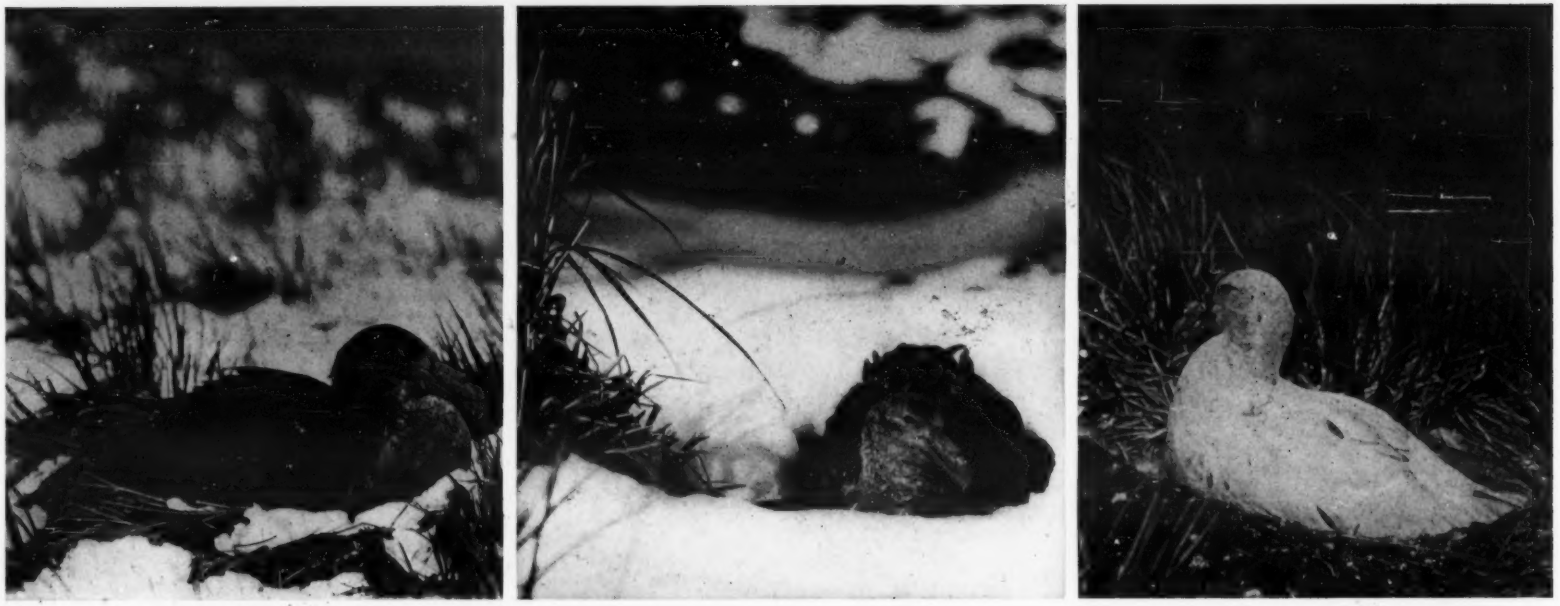
A female South Georgian teal (*Nettion georgicum*), an endemic duck which is closely related to the widely distributed South American pintail. This charming little teal is almost devoid of fear of human beings, except when it has young. It builds its embowered nest in the heart of a grassy hummock, and lays five cream-colored eggs. The ducklings are very difficult to observe, for, at the alarm note of either parent, they disappear like magic in the tussock grass. Bay of Isles, December 30, 1912

CAPE PIGEONS

The so-called Cape pigeon (*Petrella capensis*) is a familiar, Antarctic petrel, famous in the literature of the sea. It finds its northernmost breeding grounds at South Georgia, but it migrates as far as the tropics. It is a strong, rather stiff flyer, a very buoyant swimmer, highly gregarious in its feeding habits, and one of the most voracious, noisy, and quarrelsome of sea birds. It is known also by the names "speckled haglet" and "pintado petrel," but Cape pigeon is the best vernacular name, for, when it settles on the water and preens its black-and-white plumage, it looks for all the world like a true pigeon out of its element.

The species is exceedingly variable in its color pattern, the white area on the backs of some birds being extensive and almost immaculate, while others are heavily speckled with black. This is partly owing to individual differences but still more to the effects of abrasion, for the black tips of the new feathers, acquired during the Antarctic winter, gradually wear away and leave the upper surface prevailingly white before the new moult.

The flying Cape pigeon was photographed hundreds of miles from land on November 18, 1912; the swimming bird on the coast of South Georgia, November 26



GIANT FULMARS ON THEIR NESTS

This Antarctic and subantarctic, vulture-like cousin of the little Cape pigeon bears the scientific name *Macronectes giganteus;* most of the epithets by which it is known to sailors the world over are hardly fit to print. These three sitting birds were photographed at the Bay of Isles in December, 1912. The one in the center had been snowed under by a blizzard during the night before the picture was taken.

The giant fulmar is of great zoölogical interest because of its many color phases. The newly-hatched young are clad in white down, which is soon replaced by curly, light gray down. This in turn is molted as the chick approaches full growth, and is succeeded by a contour plumage of uniform shiny black. Through the effects of months of wear and fading at sea, the black feathers usually change to a dirty brown color before the recurring molt. It is not yet known how many annual molts must take place before the bird finally attains its mature plumage, but apparently this plumage may be entirely of a mixed, brownish gray color, or gray with a whitish head, or nearly pure white over the whole body. White birds are much less common than dark birds, but it is said that they are increasingly numerous southward toward the coast of the Antarctic Continent.

The color of the giant fulmar's eye is also variable. Most of the gray adults at South Georgia had a pale blue iris, although some were brown-eyed like the young birds. All of the white adults observed on their nests had brown eyes. The white bird shown above was mated with a gray bird, and their offspring, which was collected, is indistinguishable from other young giant fulmars

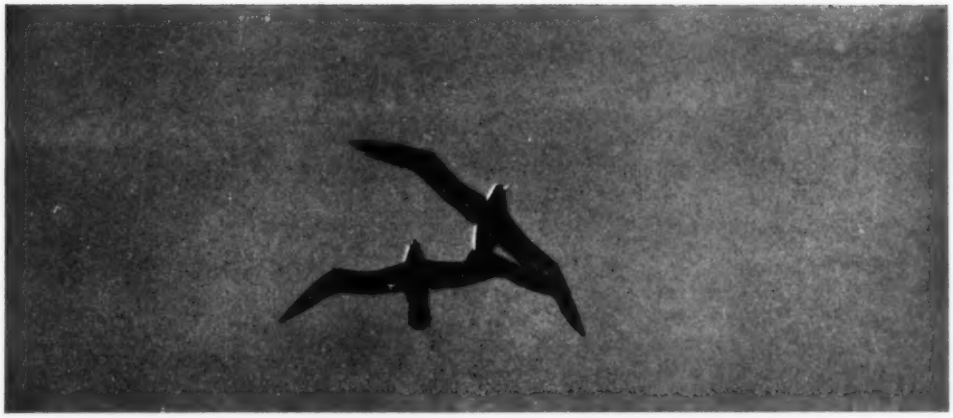
A GIANT FULMAR GUARDING ITS CHICK

The cold blue eye and terrible beak of this parent are ominous, but even more to be dreaded is the discharge of evil-smelling, half-digested, oily food, and alimentary juices, which the bird is both able and willing to squirt from its crop. Even young giant fulmars just out of the egg employ this effective method of defense against human intruders.

The giant fulmar is the only tubinarine bird that obtains a considerable proportion of its food on land, where it feeds upon carrion of any sort, such as the carcasses of seals, although it is not averse to gobbling up a young penguin or other helpless living creature. At sea it catches squids, besides devouring all sorts of floating refuse. It is an unbelievable glutton, banqueting, when opportunity offers, until it can no longer rise into flight. At such times I have surprised feasting birds, and have seen them hobble off with a curious sidewise canter, throwing up ballast as they went, until they had lightened themselves enough so that their stiffly spread wings could raise them into the air. Bay of Isles, December 23, 1912

A giant fulmar leaving its nest on a promontory over Cumberland Bay. From such a site as this, these heavy-bodied birds can easily launch into flight, while on a level surface they must run for a considerable distance, even when they are "in light ballast"

A large, black petrel (*Procellaria æquinoctialis*), which lacks an English name.—The Norwegian whalers at South Georgia call it the shoemaker "because it sits in its shop and sings." During most of the year it is a conspicuous and abundant species in the southern oceans, but in November, the Antarctic spring, it returns to land, and digs a burrow into the partly frozen soil of some tussocky hillside. Colonies of these petrels in their burrows make a chorus of sweet, bell-like pipings which can be heard a long distance, particularly on calm evenings. This "shoemaker" is flying up the fjord to its nest. Cumberland Bay, November 30, 1912



"MOLLYMOKES"

Many of the smaller albatrosses are known to seafarers as "mollymokes." These pictures are of the black-browed or spectacled albatross (*Diomedea melanophrys*), a species fairly common at South Georgia. During the long voyage to and from that island, the mollymokes were for weeks together the constant followers of our whaling brig. As they poised above the quarter-deck, or swept across the stern so closely that one could see the color of their eyes, they presented opportunities for studies in aëronautics as well as in ornithology. The lower photograph shows a bird with wings fully expanded to the light air, but the pair above, illumined by the early morning sun, are flexing their wings, or "shortening sail," in a manner which tells the initiated that a brisk breeze is blowing

THE "ANCIENT MARINER'S" BIRD AT HOME

Wandering albatrosses (*Diomedea exulans*) at their nest at the Bay of Isles, December 22, 1912. These magnificent birds, the largest flying creatures of the modern world, return to South Georgia, and begin their elaborate courtship in November. As soon as two birds have mated, they scrape together the peaty soil to form the high, truncated cone which serves as a nest, and, after the single egg is laid, they take turns in incubating. The splendid male in this home scene is as white as the fluffy, new-fallen snow in the tussock grass, save for his wings and the fine vermiculations on his back. The pair are illustrating both monocular and bifocal vision, for each bird is looking at the photographer. The male has thrown out the erectile feathers of his "eyebrows," an action which quite changes the apparent shape of the head, and which usually accompanies intense interest. The prominent "elbows" of these birds reveal the great length of the wings as compared with the stumpy tail

A MALE WANDERING ALBATROSS INCUBATING

Either the male or the female parent may begin to sit upon the new-laid egg, while the other flies off to sea to feed upon squids, remaining away, according to my records, for a period of from six to ten days. The patient sitter never stirs from its task—sleeping much of the time with head under wing, basking contentedly in the sunshine, or huddling low beneath the williwaws and blizzards. If an enemy, such as a skua gull, approaches, the albatross will chatter its bill angrily and swear. Toward men it shows neither fear nor dislike, for it looks up calmly with its large, lustrous, expressive, brown eyes, and never moves more than to rotate on the nest so as to meet its visitor face to face. When its mate returns, it slowly, seemingly reluctantly, resigns its place on the egg, and, after a few hours of "conversation" and caressing, flies off to take its turn upon the wide sea

This young wandering albatross is learning to fly. Among the smaller petrels the flight ability is thoroughly coördinated with their general development; they have no "practice," but burst from their burrowed nests when the proper time arrives, and fly away as though they had always flown. But the heavy albatross fledgling must *learn* its art. Standing on a hillside, it spreads its great, weak wings, which even at this early age have an expanse of ten feet; then it leaps into the air, and, poising for a few seconds on the wind, glides downhill, perhaps to tumble head over heels when it alights

A male sooty albatross (*Phœbetria palpebrata antarctica*) guarding its downy nestling. This dark-colored albatross is the finest flyer of all, reaching the very pinnacle of perfection in aërial grace. Unlike the other albatrosses, it nests only on the perilous ledges of mountain headlands that rise abruptly from the sea, and while one parent broods over the chick, the other may often be seen sailing with inspiring, effortless motion, back and forth in front of the cliff, always passing close to the nest and gazing with a white-ringed eye at its quiet mate. Bay of Isles, January 30, 1913

The American Ornithologists' Union[1]

By T. S. PALMER

Secretary of the A. O. U.

THIRTY-FIVE years ago, on September 26, 1883, a little group of scientific men met in the library of the American Museum of Natural History to effect a permanent organization for the advancement of ornithology. They were all deeply interested in the study of birds and believed that greater progress could be made by coöperation than by individual effort. It was essentially a group of young men, for of the twenty-one present, seven had not reached thirty and only three had passed the age of fifty. This little company together with Dr. J. A. Allen, of the American Museum, and Professor Spencer F. Baird, secretary of the Smithsonian Institution, constituted the twenty-three Founders of the American Ornithologists' Union. They builded better than they knew, for when they adjourned three days later they had laid the foundation of work which has since profoundly affected the development of ornithology in America. They had also outlined work which has since resulted in the establishment of an important bureau of the government service, the endowment of a unique association for the study and protection of birds, and has extended its influence even into the fields of legislation and international diplomacy.

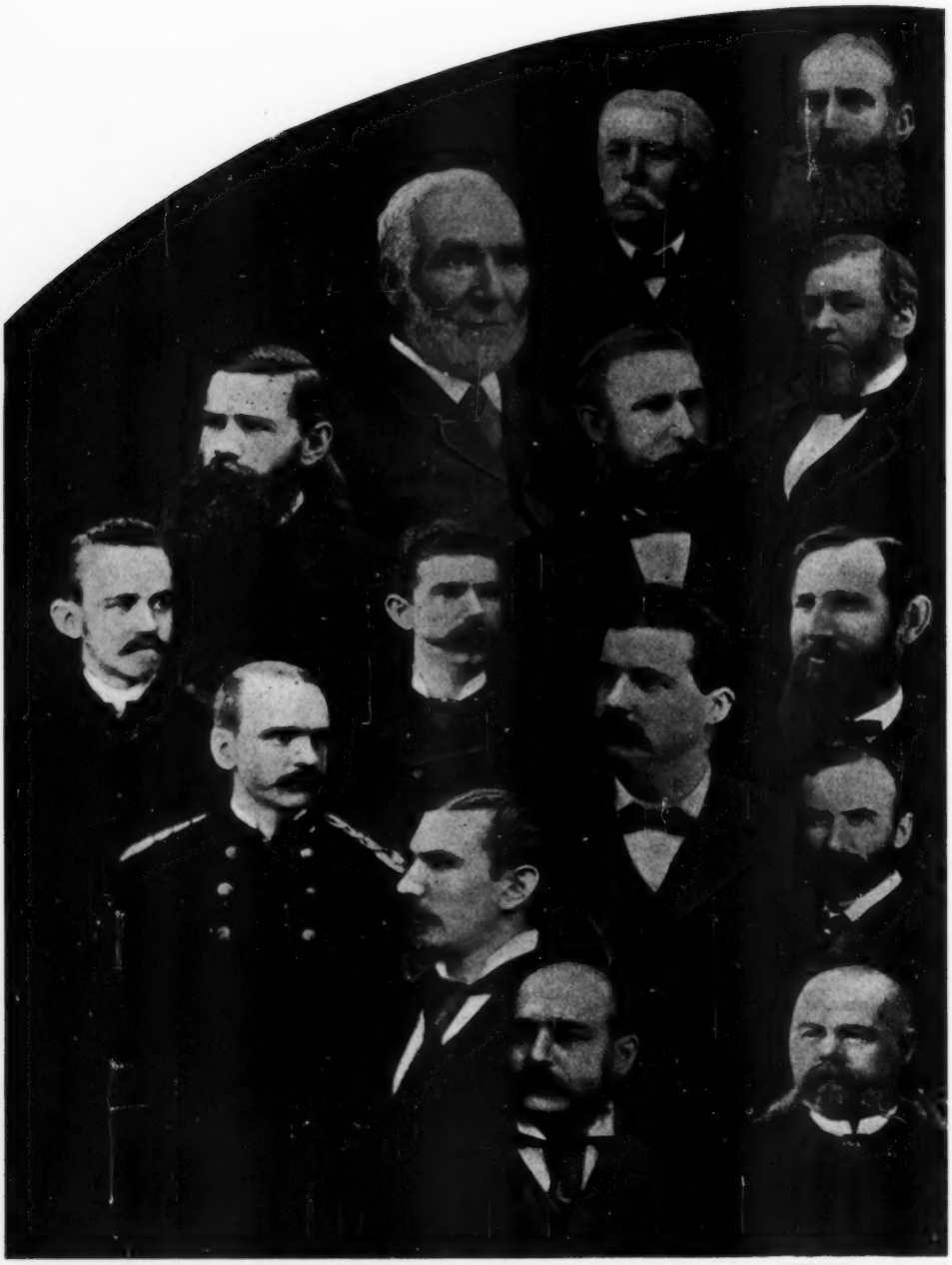
In November of this year, 1918, the Union, now the largest association of its kind in the world, with nearly a thousand members, will return for the twelfth time to revisit its *"Alma Mater,"* to review the work of the year, and to outline plans for the immediate future. It is not granted to many men to live to see the development of their early plans, but more than half of the Founders of the American Ornithologists' Union are still living and most of these are members of its council.

The chief objects of the Union according to the articles of incorporation, for the Union was duly incorporated as a national organization in 1888, are "the advancement of its members in ornithological science and the publication of a journal of ornithology and other works relating to that science." The first object is attained through personal intercourse, meetings, correspondence, and the promotion of projects of common interest, and the second through publications which have now become widely known.

Membership in the American Ornithologists' Union

Membership in the Union is open to any reputable person who has an interest in birds or bird study. The qualifications of the different classes of members are so graded that any one, whether a professional ornithologist, or a bird lover familiar with only a few common species, can find congenial spirits who have interests in common. To meet the needs of the various groups between these extremes, the By-Laws provide seven classes of membership, but virtually these groups are reduced to four: (1) Fellows, limited to 50 in number and eligible to office; (2) Members, limited to 100, who share with Fellows the right to participate in the business of the Union; (3) Associates, unlimited in number; and (4) Foreign Members, divided into two groups of (a) Honorary

[1] The next meeting will be held at the American Museum of Natural History, New York, November 11–14, 1918. Information concerning the Union may be had on application to the Secretary, 1939 Biltmore Street, N. W., Washington, D. C.



Founders and Officers of the American

DR. E. A. MEARNS, U. S. A.
NATHAN C. BROWN.
DR. R. W. SHUFELDT, U. S. A.

THOMAS MOILWRAITH.
ROBERT RIDGWAY, VICE-PRESIDENT.
C. B. CORY.

DR. J. B. HOLDER.
H. W. HENSHAW, COUNCILOR.
DR. C. HART MERRIAM, SECRETARY.
H. A. PURDIE.

DANIEL G. ELLIOT.
PROF. SPENCER F. BAIRD, COUNCILOR.
J. A. ALLEN, PRESIDENT.
MONTAGUE CHAMBERLAIN, COUNCILOR.
CAPT. CHARLES E. BENDIRE, U. S. A.

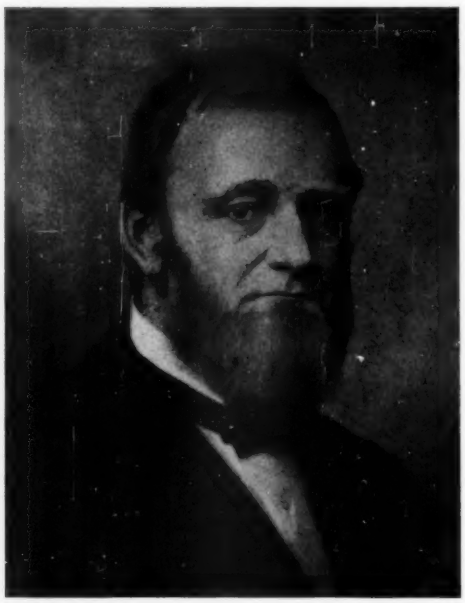
Ornithologists' Union. 1883.

HON. CHARLES ALDRICH.
DR. J. M. WHEATON.
DR. A. K. FISHER.
GEORGE N. LAWRENCE, COUNCILOR.
PROF. ELLIOTT COUES, VICE-PRESIDENT.
CHARLES F. BATCHELDER.
WILLIAM BREWSTER, COUNCILOR.
DR. D. W. PRENTISS.
H. B. BAILEY.
EUGENE P. BICKNELL.

THE HISTORICAL GROUP OF THIRTY-FIVE YEARS AGO

The group includes the twenty-three Founders and Messrs. H. W. Henshaw and G. N. Lawrence who were members of the first Council. The call for the original meeting was signed by J. A. Allen, Elliott Coues, and William Brewster. Thirteen of these members are still living, and nine, including Dr. Allen who served for seven years, have filled the office of president. Five, including Captain Charles E. Bendire, Dr. Elliott Coues, Dr. E. A. Mearns, Dr. D. W. Prentiss, and Dr. R. W. Shufeldt, served in the Army; of these, Dr. Shufeldt, now a major in the Medical Corps, is the only survivor. Among the other more prominent members were Professor Baird, secretary of the Smithsonian Institution and "Nestor of American Ornithologists"; Mr. George N. Lawrence who assisted in the preparation of several early government reports on birds; and the following ex-presidents: Charles F. Batchelder, for many years associate editor of *The Auk*; C. B. Cory, who has published extensively on the birds of the West Indies; Dr. D. G. Elliot, author of numerous illustrated monographs on birds; Dr. A. K. Fisher, who has given special attention to hawks and owls; Dr. C. Hart Merriam, founder of the Biological Survey in the United States Department of Agriculture; and Robert Ridgway, curator of birds in the United States National Museum, whose great work on the *Birds of North and Middle America* is now in course of publication. When these photographs were taken, comparatively few of the members had accomplished the work which has since made them well known

Fellows, limited to 25, and elected on account of their eminence as ornithologists; and (b) Corresponding Fellows, limited to 100. Fellows and Members are residents of the United States and Canada; Associates, of any part of America; and Honorary or Corresponding Fellows, of any country. The other two groups comprise Fellows who, no longer active, have been transferred to the class of Retired Fellows, and Patrons, including persons who, desirous of furthering the aims of the Union, contribute the sum of $1000 for such purpose. This group as its name indicates is intended to distinguish those members who by their breadth of view and interest in the subject make possible the advancement of ornithology either in the fields of research or in applied science.[1]



Spencer Fullerton Baird,[2] after a crayon portrait by Henry Ulke, in 1883, the year of the organization of the A. O. U. Baird was a man of wonderful ability. He was a friend of Audubon, and his collection of birds afterward formed the nucleus of the National Museum collection. He acted as secretary of the Smithsonian Institution from 1878 to 1887 and was the organizer of the United States National Museum and of the United States Commission of Fish and Fisheries. He was the author of *Birds of North America*, *Review of American Birds*, and (with Brewer and Ridgway) of five volumes on the land and water birds of North America

The list of members includes many of the most eminent ornithologists in this country and abroad, while among the names of members now deceased may be found those of many well-known men whose works live after them. Among the latter are George N. Lawrence and Spencer F. Baird, the leading American ornithologists of their day, whose best work was done about the middle of the nineteenth century; and Coues, Bendire, Merrill, and Mearns whose names recall the valuable contributions to ornithology made by officers of the Army. Among the Honorary Fellows may be found the names of Huxley, Sclater, Sharpe, and Wallace, known the world over wherever the study of birds has received attention.

The business of the Union is conducted by the president, two vice-presidents, a secretary, treasurer, and a council of seven members. Officers and ex-presidents are *ex officio* members of the council, and the editor of the jour-

[1] No initiation fee is required and the annual dues are $5 for Fellows, $4 for Members, and $3 for Associates. Life membership securing exemption from further assessment may be obtained upon payment of $100 by a Fellow, $75 by a Member, or $50 by an Associate. Patrons and Retired, Honorary, or Corresponding Fellows are exempt from dues and all classes of members except Corresponding Fellows receive the journal free.

[2] This portrait of Professor Baird, made in 1883, is apparently an unpublished one and historically correct for the date. At this time he was sixty, and evidently showed his age, for this was only two years before his health broke down and only four years before his death. Compare with the picture in the large group (page 474) which is the standard and undoubtedly the best picture of Baird and is from a photograph taken about 1875 by Mr. T. W. Smillie, photographer of the U. S. National Museum. Baird, then fifty-two years old, was in the height of his vigor, planning for the exhibit in the Centennial Exposition, which was made the stepping stone to the foundation of the National Museum, the ambition of his life. An interesting point is that the Smillie photograph faces to the left while the Ulke pictures (of which the writer has seen two) face to the right.

nal is elected by the council. Although all the officers are elected annually some of them have been reëlected a number of times. Dr. J. A. Allen, the first president, served for seven years and filled the position of editor for twenty-eight years. Mr. John H. Sage, the present president, was elected in 1917, after having served as secretary for twenty-eight years. Two of the treasurers, Mr. William Dutcher and Dr. Jonathan Dwight, have served sixteen and fifteen years respectively. Thus the general policy of the Union has been maintained on a singularly uniform and conservative basis.

Dr. Joel Asaph Allen, who has just celebrated his eightieth birthday, served seven years as the first president of the American Ornithologists' Union, and twenty-eight years as editor of its publications. He is author of nearly one thousand papers and reviews on ornithology, many biographical sketches of ornithologists, and a series of papers on nomenclature, besides many publications on mammals and other subjects. This photograph was taken in 1885 when he became curator of ornithology and mammalogy in the American Museum of Natural History, with which institution the A. O. U. has always been very closely associated

Women as Workers in Ornithology

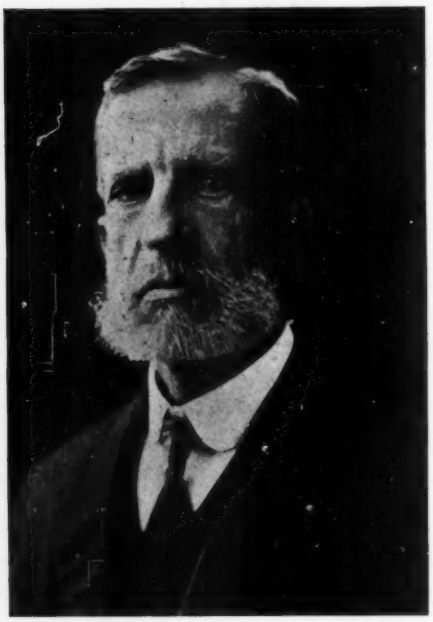
Membership in the Union is open to women on the same terms as men. Sex has been no bar to election, and meritorious work by women has always received prompt recognition. More than 140 women are now on the rolls, four of whom have been elected Members, and one a Corresponding Fellow. They take part in the annual meetings and frequently present papers containing important original observations. It is hardly to be expected that women will have the same active interest as men in collecting birds in the field, but several of the members do not hesitate to venture into the wilds in quest of specimens and data when opportunity offers. Dr. Emilia Snethlage, a Corresponding Fellow who is director of the Pará Museum in Brazil, has made several expeditions into the tropical forests of the Amazon region, and published the scientific results of her trips. Miss Annie M. Alexander, founder of the Museum of Vertebrate Zoölogy at Berkeley, California, has organized and personally conducted several expeditions to Alaska and to remote sections of California. Mrs. Florence Merriam Bailey has accompanied her husband on many field trips in the West and has thus collected material for her well-known *Handbook of the Birds of the Western United States*, her recent papers on the birds of the Glacier National Park, and other publications on the birds of the West. Mrs. Bailey was the first woman elected to the Union and for two years was the only feminine member.

In several lines of work women are especially fitted not only to make substantial contributions to knowledge but to advance the cause of ornithology. In making observations on habits and migration, in presenting the subject in

popular form, in teaching, and in arousing an interest in birds among the younger generation, they have already accomplished invaluable work. The observations of Miss A. R. Sherman and Mrs. Irene G. Wheelock, the works of Mrs. Olive Thorne Miller and Mrs. Mabel Osgood Wright need only be mentioned as illustrations, while the interest which Mrs. Russell Sage has shown in the cause of popular education and bird protection has made possible results accomplished by few other persons either in this country or abroad.

Meetings and Field Journeys of the American Ornithologists' Union

Regular meetings are held annually, usually in November, and continue four or five days. The first day is devoted to the transaction of business and the next three days to public sessions for the presentation of scientific papers. An informal dinner is usually arranged for one of the evenings, and the fifth day is devoted to an excursion or a visit to some zoölogical garden, museum, or other point of ornithological interest. The excursions have included, besides zoölogical gardens, several points of historic or scientific interest such as Audubon's home, Bartram's garden, and the New Jersey pine barrens near Philadelphia; the New York Aquarium and the Brooklyn Museum; trips to Concord, the Thayer Museum at Lancaster, and the Ipswich sand dunes from Cambridge; and the headquarters of the Biologists' Field Club at Plummer Island in the Potomac near Washington. As a matter of convenience, meetings are usually held in the four cities which have large public museums and near which most of the members are located, namely, Cambridge, New York, Philadelphia, and Washington. Local scientific societies such as the Nuttall Ornithological Club of Cambridge, the Linnæan Society of New York, the Delaware Valley Ornithological Club, and the Biological Society of Washington usually take part in entertaining the members.



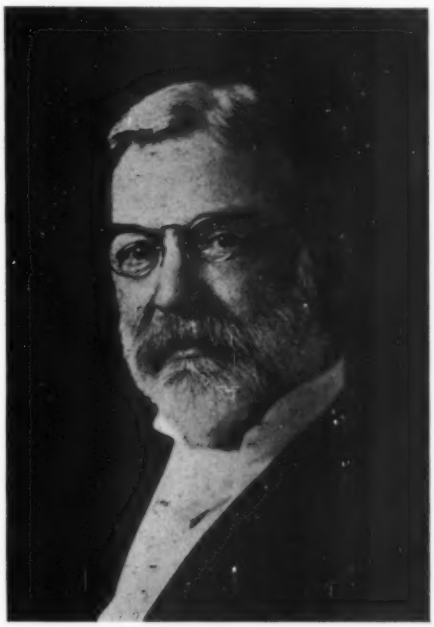
John Hall Sage, president of the American Ornithologists' Union, today.—Prior to becoming president of the Ornithologists' Union he served as secretary of the organization for twenty-eight years. He is a Fellow of the American Association for the Advancement of Science and a member of the New York Academy of Sciences and of the Biological Society of Washington. In collaboration with Dr. L. B. Bishop he published *The Birds of Connecticut*, in 1913. (Half tone from a photograph taken in 1918)

On two occasions, in May, 1903, and May, 1915, the Union crossed the continent to meet in San Francisco with the Cooper Ornithological Club. On the former occasion a week was spent *en route* and stops were made at Santa Fé, New Mexico; in the Painted Desert, and at the Grand Cañon in Arizona; and in the Mohave Desert, and at Los Angeles in southern California. Side trips were also made to Monterey, the Farallon Islands, Los Banos, and the Yosemite Valley, thus affording most favorable opportunities for comparing the fauna and flora of several widely different regions. On the latter occasion stops were made at the Grand

Cañon and Los Angeles, a week was spent at the Panama-Pacific Exposition, and side trips to the redwoods and the Yosemite Valley were arranged for those who could take them. A permanent and instructive exhibit of one of these trips may be seen in the American Museum in two of the habitat bird groups—"Brandt's Cormorant at Monterey" and "Summer Bird Life of the San Joaquin Valley"—the material for which was collected in 1903.

Scientific Work of the A. O. U.

The decade immediately preceding the organization of the Union was a period of great activity in the study of North American birds. Many books and papers had been published, but the classification and nomenclature which they followed were not always uniform and it was not uncommon for a bird to appear under several scientific names. In fact two check lists of birds, differing widely in classification and names of some of the species, were in common use. To remedy this confusing condition a committee on classification and nomenclature was appointed at the first meeting and at once began a thorough review of the whole subject. Rules of nomenclature known as the A. O. U. Code were adopted and later were accepted by virtually all American ornithologists and many workers in other branches of zoölogy. They have since been incorporated in large part in the International Code of Nomenclature. A new check list was prepared in which well-marked species were indicated as usual by binomial scientific names, while birds which are slightly marked and grade into geographic forms or subspecies were designated by trinomials. Thus the name of the common red-headed woodpecker is *Melanerpes erythrocephalus,* but that of the California woodpecker which grades into several forms is *Melanerpes formicivorus bairdi.* Instead of beginning with the highest birds and running down the scale, the new list followed the more logical plan of beginning with the lowest or most generalized and working gradually up to the highest or most specialized forms. The year 1758 was recognized as the beginning of binomial nomenclature and the earliest available scientific name after this date was adopted for each bird. The report of the committee, published after three years of laborious investigation, formed a volume of nearly four hundred pages and was at once accepted as the standard authority on the names of North American birds. In this respect the committee succeeded beyond expectation in its difficult task. As new birds were discovered or changes in names were made necessary by progress in knowledge, supplements were issued



William Dutcher, president of the National Association of Audubon Societies, was treasurer of the Ornithologists' Union from 1887 to 1903. His name stands for bird conservation, that most popular branch of applied ornithology, and it is largely due to his enthusiastic efforts that such rapid strides were made in bird protection between the years 1896 and 1905, resulting finally in the establishment of the National Association of Audubon Societies and its incorporation in the latter year. (From a photograph of 1910)

from time to time and later incorporated in new editions of the check list of which the second was published in 1895 and the third in 1910.

Three other committees, also appointed at the first meeting, those on migration, geographic distribution of birds, and on the status of the English sparrow, began the collection of data on such a comprehensive scale that the work soon outgrew the resources of the Union to handle it. In 1885 Congress was induced to provide a special appropriation for carrying it on in connection with the investigations of the United States Department of Agriculture, and thus was founded the Division of Ornithology which later developed into the present Bureau of Biological Survey. The first bulletin issued by the Division was a *Report on Bird Migration in the Mississippi Valley,* the forerunner of many other publications on migration and geographic distribution; and the second was a comprehensive bulletin on *The English Sparrow in America,* the initial number of a long series of reports on the food and the economic relations of birds.

Some Publications of the A. O. U.

As a publisher the American Ornithologists' Union occupies a field peculiarly its own and concentrates its energies on the two main objects of keeping its members informed concerning (1) current literature on birds and all that relates to their food, migration, and life histories; and (2) the latest facts concerning the nomenclature and distribution of the species found in North America. To attain these objects it issues a quarterly journal and occasional check lists. It has never undertaken the publication of memoirs, monographs, or similar extended papers usually issued by academies of science and other scientific institutions, or manuals, handbooks, or works containing popular descriptions of birds which are brought out frequently by private publishers. Its journal, known as *The Auk,* in accordance with the custom of naming ornithological journals after some characteristic bird, serves as a medium of publication for papers or short notes on any phase of ornithology. A bound set of this journal, now in its thirty-fifth volume, fills a five-foot shelf and contains an epitome of the principal ornithological work in America since 1883. *The Auk* is practically a continuation or second series of the *Bulletin of the Nuttall Ornithological Club* which was published from 1876 to 1883. It is especially rich in short notes, faunal papers or local lists of birds of special regions, and reviews of publications on birds which have appeared elsewhere. A general index has been published containing references to all the articles in the *Bulletin* and in *The Auk* from 1883 to 1900, while a decennial index covers the volumes from 1901 to 1910. Thus by means of these two indexes and the annual indexes the great mass of records and notes contained in about eighteen thousand printed pages are rendered accessible to the general reader.

The other publication, an authoritative list of the genera, species, and subspecies of birds found in North America north of Mexico, with a statement of the geographic distribution of each form, is known as the *A. O. U. Check-List.* An abridged check list, containing only the names, was published in 1889, and a pocket edition for field use in 1911. These publications, technical as they may seem at first sight, contain much of interest and are highly valuable as works of reference. Even the *Check-List* contains many facts which only require elaboration to make them interesting. Any one who will glance over the charming chapter on "Reading a Check-List" in Bradford Torrey's *Field-Days in California* will be inclined to agree with the author that "for the right man there's a world of good reading in a check-list."

The Influence of the A. O. U. on Bird Protection

Not less important than the scientific and economic work which was taken over by the Department of Agriculture is that relating to the protection of birds. At the Second Congress in 1884, a committee on bird protection was appointed and at once entered upon an active campaign. Wholesale bird slaughter was then at its height due to the enormous demand for plumage by the millinery trade and the traffic in birds' eggs and skins which was fostered by dealers and taxidermists. A comprehensive law for the protection of birds, now known as the "Model Law," was prepared by the committee and was adopted by New York in 1886, and later in modified form by nearly three fourths of the states. This law differed from similar statutes then in force by dividing all birds into three groups, protecting at all seasons nongame birds, for example, thrushes; allowing a season for hunting game birds, such as the quail; and withdrawing protection from such injurious species as the English sparrow. Ample provision was made for scientific work under a system of permits. Simultaneously with the new law, the first Audubon movement was launched in 1886, but after a few years began to languish. Ten years later it was again started on a different and more permanent basis and soon developed to large proportions.

Mrs. Florence Merriam Bailey was the first and for two years the only woman member of the American Ornithologists' Union, which now numbers 140 women on its rolls. Among her publications on ornithology are: *Birds Through an Opera Glass*, *Handbook of the Birds of the Western United States*, and many papers on western bird life

In the decade from 1896 to 1905 rapid progress in bird protection was made under the enthusiastic leadership of Mr. William Dutcher. In 1896 commercial destruction of sea birds' eggs on the Farallon Islands in California was stopped. In 1900 the first practical work of guarding breeding colonies of sea birds along the Atlantic Coast was made possible by means of the Thayer Fund, the first steps were taken in the organization of the National Committee of Audubon Societies, and the first Federal game law, the Lacey Act, was passed by Congress. The year 1903 was marked by the establishment of the first Federal bird refuge on Pelican Island, Florida, and an agreement with the millinery trade to check the traffic in plumage of native birds. In 1905 the National Association of Audubon Societies was incorporated, and the narration of subsequent events belongs more properly to the history of that organization.

Reference, however, may be made to several matters in order to complete this sketch of American bird protection. In 1906 the National Association of Audubon Societies received an endowment and this fund, gradually increasing, provides a permanent and assured income for carrying on its work of practical bird study and protection. It may be noted incidentally that the officers of the National Association are all members of the Union. In 1913

Congress enacted the Federal Migratory Bird Law, and it is interesting to recall that the members of the committee which prepared the regulations for carrying it into effect were Fellows of the American Ornithologists' Union. Finally in 1916 a treaty for the protection of migratory birds in the United States and Canada was concluded by the United States and Great Britain, followed in 1918 by an act of Congress and the regulations necessary for carrying it into effect. In these negotiations members of the Union again took an important part. Thus in thirty-four years the work of applied ornithology originated by the committee on bird protection has developed in one direction into that of the National Association of Audubon Societies, a permanently endowed corporation, and in the other has found expression in the form of state and Federal laws and also in an international treaty covering migratory birds from the Gulf of Mexico to the Polar Sea.

The American Ornithologists' Union and the World War

Like other national organizations the American Ornithologists' Union is taking its part in carrying on the great World War. It has invested in Liberty Bonds, it has members in several branches of the military and naval service, and its members at home are assisting in war work with the Red Cross and in various other ways. Those members who have joined the colors are exempt from dues during the war, and to provide for these dues a fund is being raised by special contributions. After the war, this fund will become part of the permanent endowment fund and the income will be available for publications.

Nearly 10 per cent of the membership, exclusive of the Foreign Members, is already in military service, and the proportion is likely to be greatly increased in the near future. The men are in all ranks from private to colonel in the Army and from seaman to lieutenant in the Navy. Many are now in France, some in the American Expeditionary Forces, and some in the Canadian Expeditionary Forces, while others are in training camps and cantonments in this country, eagerly awaiting an opportunity to go to the western front. Most of them are in the infantry, artillery, or medical corps but others have been detailed to special duty for which they are peculiarly fitted by previous training. Destroying rats in the trenches and in quartermasters' stores, examining recruits for hookworm, caring for birds in the pigeon service, acting as gun pointer in a naval crew on a merchant vessel, sighting rifles in an arms factory, and assisting in *camouflage* experiments are only a few of the actual duties performed by ornithologists in connection with the war. Letters from some of the men indicate that their interest in birds remains unabated, notwithstanding the serious work in which they are engaged, and requests have been received even from the trenches for pocket handbooks in English containing descriptions of birds likely to be met with in France. But whether at home or over there, whether detailed to the aviation corps, on the seas, or in the trenches, A. O. U. men are finding their field experience and their habits of observation acquired in pursuit of science of the highest service in the grim work of war.

What of the Future?

While reviewing its past record with pardonable pride, the Union may well feel confident that the future offers opportunities for even greater accomplishments. With an adequate endowment, an enlarged field of publication, and a membership of several thousand, including workers in every branch of technical and applied ornithology, the American Ornithologists' Union will be in a position to advance the study of

ornithology on a broader scale than has hitherto been possible.

On every side technical, theoretical, and practical problems await solution. The problem of the subspecies only begins with the naming of an obscurely marked form, and the more difficult questions of the bird's distribution, life history, and relation to other forms still remain to be worked out. In spite of the progress made in recent years certain mysteries of bird migration still confront us. Where is the winter home of the chimney swift or the breeding ground of the blue goose? These familiar questions cannot remain unanswered much longer. As for other questions of migration, bird banding promises to throw much light on the routes traversed by migrants, and aviation on the height and speed at which birds travel. How shall we learn more of the extinct birds of America now known only by a few fragmentary bones, and how shall we prevent from becoming extinct other valuable species now threatened with extermination? These and other problems ranging from the purely theoretical to the severely practical await solution by competent investigators.

Even amid the distractions of war, plans are being made for broadening the scope of the American Ornithologists' Union so as to make the organization international in fact and enable it to assume its share of the larger undertakings in the world's work. To each and all who are interested in birds the Union extends a cordial invitation to join in the advancement of ornithology and the advancement of members in ornithological science.

Figure from a recent number of *The Auk*, official organ of the American Ornithologists' Union, illustrating the study of life histories of birds in the field. This nest of the bay-breasted warbler (*Dendroica castanea*) was photographed by Messrs. P. B. Philipp and B. S. Bowdish in June in northern New Brunswick. Collectors of the American Museum of Natural History have found this warbler in the mountains of Colombia between the middle of December and March 10. The route by which the bird reaches the tropics and returns again the next spring is one of the problems of migration as yet unsolved. Since the bay-breast occurs neither in Mexico nor Florida, it is supposed to fly across the broad expanse of the Gulf of Mexico in the course of its long journeys from its breeding grounds to its winter home and back again

RIO NEGRO CAÑON IN THE EASTERN ANDES

Eastern ridge, near Monteredondo, altitude 4500 ft. (Junction of Orinocan Tropical and East Andean Subtropical Faunas)

The Chapman expedition stopped at Monteredondo and Quetame (five miles west) while following the ninety-mile trail from Bogota to Villavicencio and the llanos of eastern Colombia. There was scarcity of forest growth, therefore few tree-loving birds. Mingled with the subtropical birds were representatives of the Temperate Zone above and of the Tropical Zone below. This very evident mingling of zonal species was not often found; zones were usually sharply marked off.

It is chiefly from the Bogota region that millions of skins of small birds, collected by natives with blowguns, have been sent to Paris and London for millinery purposes. The trade began about 1840 and was at its height in 1885. Many of these specimens reached scientific institutions but all were without scientific data of any kind. In the latitude of Bogota the Eastern Andes have a width of about 100 miles. There is very great need for further exploration work in this eastern mountain range

"The Distribution of Bird-Life in Colombia" A Review*

By ARTHUR A. ALLEN

Assistant Professor of Ornithology, Cornell University

OF the nineteen or twenty thousand species and subspecies of birds known to inhabit the world, from four to five thousand, or about one fourth, are found in South America. South America, therefore, is the richest part of the globe in variety of bird life. The vast stretches of forest and llanos, the high mountains, the isolated ridges, the great altitudes and extensive latitudes, with their resulting diverse climatic conditions, all combine to create the innumerable isolated environments that are necessary for the development of a great variety of species.

In South America there are found not only a larger number of species but also a far larger number of families than in other regions of the world, showing either that the birds have diverged more widely from their ancestral types or that more of the connecting links have been preserved. The latter is more likely to be the case because most of the families are still those which are considered low in the scale of evolution. Some of these families have many representatives in Africa; others seem related to Australian forms, and still others, like the humming birds, tanagers, orioles, and warblers, undoubtedly represent the stock from which many of our North American birds were derived. Indeed, the origin of North American birds and the perplexing problems of their distribution and migration are so closely linked with the origin and distribution of South American birds that it seems necessary to understand the problems of South American bird life before we can go very far with our own. When we know where the ancestors of our birds lived and where they probably came from, we can deal more intelligently with the mysteries that still enshroud the lives and movements of our own birds.

It was with this ultimate aim that, in December, 1910, the American Museum of Natural History inaugurated its extensive zoölogical survey of South America. As the first great step in its accomplishment, Dr. Chapman has now published the result of seven years' study, "The Distribution of Bird-Life in Colombia."

When the work was conceived, it was thought that most of the exploration had already been accomplished and that the list of South American birds was reasonably complete. The first contribution was to be in the nature of a survey of the distribution of the birds already described. As material came in from the various collectors, however, and also through expeditions which Dr. Chapman himself led into Colombia, it was discovered that there was still a good deal of preliminary work to be done. In fact, before the paper on the distribution of bird life could be prepared, Dr. Chapman found it necessary to describe from Colombia alone, 22 species and 115 subspecies of birds new to science.[1]

But it was not only in the descriptions of new species that pioneer work had to be done. Some of the expeditions extended their explorations into little-known parts of Colombia that had never been accurately mapped.

[1] *Bulletin American Museum Natural History*, XXXI, 1912, pp. 139–166; XXXIII, 1914, pp. 167–192, pp. 606–637; XXXIV, 1915, pp. 363–388, pp. 635–662.

* *Bulletin of the American Museum of Natural History;* Vol. XXXVI, 1917, The Distribution of Bird-Life in Colombia; A Contribution to a Biological Survey of South America, by Frank M. Chapman.

Always detailed accounts of the country traversed were preserved, altitudes taken, and the nature of the water courses and forests recorded—information of utmost importance for Dr. Chapman's study of the distribution of bird life and of almost equal importance to a knowledge of the commercial or economic development of the country. The descriptions of transportation facilities, roads, and trails found in Dr. Chapman's volume are valuable not only to the zoölogist but to travelers or explorers, particularly at this time when Colombia seems to be on the verge of an economic awakening.

The large number of photographic illustrations of the country add greatly to the value and interest of the written descriptions. The maps of the life zones, which are likewise crop zones, and the map of the distribution of the forests will be welcomed equally by zoölogical, botanical, and commercial investigators. What is important to the zoölogist in planning an expedition to collect as many forms of life as possible is equally important to the promoter of a railroad or to anyone seeking the development of the agricultural resources of the country. The climatic factors which control the distribution of animal life likewise influence the growth of crops and the development of forests or grazing country, and upon these depend the building of railroads and the growth of cities. The life zones of Colombia found in Dr. Chapman's report are based upon the distribution of bird life. Each zone, however, has its characteristic plants and trees and its characteristic cultivated crops. A glance at the map will show equally well where one can expect to find black merulas or where one can grow wheat. Where red-rumped tanagers occur, there coffee grows well.

The topography of Colombia and the resulting life zones are as varied and interesting as can be found anywhere in the world. This region, lying, as it does, just north of the equator, between the first and twelfth parallels of latitude, might be expected to possess a uniformity of life and climatic conditions, but because of the mountains there is a greater diversity than occurs between Florida and Greenland. Palms and glaciers, dripping forests and sandy deserts, tropical heat and blinding snowstorms greet the traveler in rapid succession.

The great chain of the Andes breaks up into three ranges in southern Colombia, being separated by the Cauca and Magdalena valleys. The highest peak is Nevada del Tolima of the central range, 18,500 feet, a symmetrical cone of gleaming snow, extending 6000 feet above the forest-covered ridges about it. The eastern range continues northward nearly to the Caribbean Sea but is separated by the valley of the Cesar from the isolated ridge of the Santa Marta Mountains. The central range extends not quite so far, being interrupted by the Cauca River as it swings eastward to join the Magdalena. The western range was, at one time, Dr. Chapman points out, continuous with the mountains of Central America, but a great subsidence has taken place in northwestern Colombia and in Panama rather recently geologically, leaving the high peaks of western Panama and Costa Rica with no direct faunal connection with the Colombian mountains but with every evidence of once having been continuous with them.

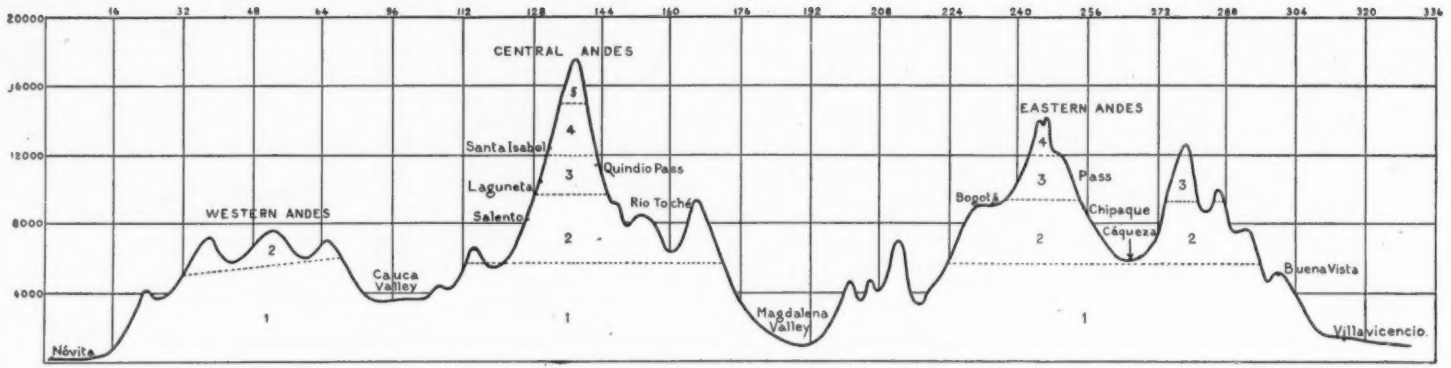
Between the western and central ranges extends the Cauca Valley, a flat plain about thirty miles wide. Through it winds the Cauca River, a fair-sized stream, navigable to river steamers in its lower and upper courses but interrupted in the middle by a series of rapids. The upper valley is apparently the bed of an ancient lake which broke through its northern barrier, forming the cañon of the Cauca and the rapids in that region. The land is fertile, therefore, and although at present

much of it is given over to grazing instead of agriculture (doubtless owing to transportation difficulties), sugar, coffee, cacao, rice, and tropical fruits grow luxuriantly. The Magdalena Valley, between the central and eastern ranges, is somewhat broader and much more arid except in its lower (northern) reaches where it is quite the reverse. The extensive level region east of the eastern range is similar to adjacent parts of Venezuela and Brazil, there being llanos north of the Guaviare River, and south of it the great Amazonian forest.

Dr. Chapman points out that all the life of tropical South America was probably alike prior to the rise of the Andes Mountains and as late as the latter half of the Tertiary period. If, at that time, there were no mountains to act as barriers to the moisture-laden winds and no differences in altitude, the sea of life that flowed through the continuous forest must have been quite uniform from the Atlantic to the Pacific. Indeed, today, the faunas of the tropical Pacific area and the great Amazonian forest are very similar in spite of the barrier separating them. But with the rise of the mountains, there came great differences in climatic conditions and eventually five distinct areas could be recognized. West of the mountains was an area of great condensation, the moisture-laden winds from the sea giving up most of their vapor and causing vegetation of great luxuriance to grow. Northward, along the Caribbean Sea, was an area which, entirely cut off by the mountains from those breezes, then became arid. East of the mountains, the northern Orinocan part became arid while the southern part received its moisture-laden winds from the southeast and remained extremely humid. The valleys of the Cauca and Magdalena became more or less cut off from the other regions by the mountain barriers and formed a fifth area, part arid and part humid.

Altitudinally the change was even more striking. Beginning at sea level and continuing up to an altitude of from 4500 to 6000 feet, the tropical forests and all their life continued to luxuriate. From the upper reaches of the tropical belt to about 9000 or 9500 feet, conditions changed. The temperature decreased and the growing season became shorter. Tropical forms either had to adapt themselves to the shorter, cooler season or perish, and so, as they were carried upward by the rise of the mountains, many new forms or adaptations arose and a new fauna was established which Dr. Chapman has called the Subtropical Zone fauna. As the mountains rose higher and higher, a third belt was correspondingly formed so that today between 9000 to 9500 and 11,000 to 13,000 feet, we have the Temperate Zone. Conditions here are not unlike those of temperate North America, or South America in Chile and Argentina. In fact, so like were the conditions of southern Chile to those of the mountains of Colombia, Ecuador, and Peru above 9500 feet, that many southern forms of this region extended their ranges northward to occupy the territory newly formed. Thus while the birds of the Subtropical Zone, between 4500 and 9000 feet, are today most closely related to the tropical forms below them, the birds of the Temperate Zone are most closely related to the seacoast forms of southern Chile.

At an altitude of from 11,000 to 13,000 feet, tree growth stops. The season is too short for any tree to thrive and there is an area of sedges, herbaceous plants, and curious woolly perennials. This is the region called Paramo and extends up to snow line at about 15,000 feet. It is a land of fog and sleet during the bleak months of its winter, and even during its short summer clouds roll up from the forests below to obscure the landscape part of the day.



LIFE ZONES OF THE COLOMBIAN ANDES

Temperature as influenced by altitude brings about a division of Colombia vertically from sea level up to the highest point of the Andes into life zones as follows: 1—Tropical (sea level to 4500–6000 ft.), 2—Subtropical (4500–6000 to 9000–9500 ft.), 3—Temperate (9000–9500 to 11,000–13,000 ft.), 4—Paramo (11,000–13,000 to snow line about 15,000 ft.), 5—Perpetual Snow (above 15,000 ft.).

Comparison of this semi-diagrammatic profile with the map in color opposite will make clear the topography of Colombia and division into these life zones and into faunal areas. The Andes break up here into three ranges alternating through a distance of about 300 miles from west to east with first, the low Pacific Coast, second, the Cauca River Valley, third, the Magdalena River Valley, and fourth, on the east, the Orinoco River drainage. The central range is the most lofty, its highest peak, Tolima, reaching 18,500 ft.; the western range is low, not reaching to snow line; the eastern range is the most extensive; the isolated Cauca Valley is from twenty to thirty miles wide and the Magdalena somewhat wider, both arid in their upper (southern) portions. East of the eastern range, the Orinocan drainage toward the north consists of llanos, and the Amazonian drainage at the south of tropical forest.

Comparison of profile and map with the series of photographs following (also with the map on pages 496 and 497) will give an understanding of the types of country in which the bird life was investigated by the Chapman expeditions of the American Museum. The work done by Dr. Chapman in mapping Colombia's life zones and faunal areas is of interest not only to zoölogists but also to travelers and explorers generally, and is of value for the economic development of the country itself. The zones of the distribution of bird life are also Colombia's crop zones

Colombian Life Zones (vertical distribution) and Faunas (horizontal distribution in the Zones)

Colombia is a country just north of the equator, yet because of its mountains, it has as great diversity in climate and plant and animal life as can be found anywhere on the earth. Palms and glaciers, dripping forests and sandy deserts, tropical heat and blinding snowstorms, greet the traveler in rapid succession. In the development of faunas in Colombia, humidity, character of soil, and ease of access have been the active agents.

Tropical Zone
- Colombian-Pacific Fauna
- Cauca-Magdalena Fauna[1]
- Caribbean Fauna
- Orinocan Fauna
- Amazonian Fauna

Subtropical Zone
- West Andean Fauna
- East Andean Fauna

Temperate Zone
- Temperate Fauna

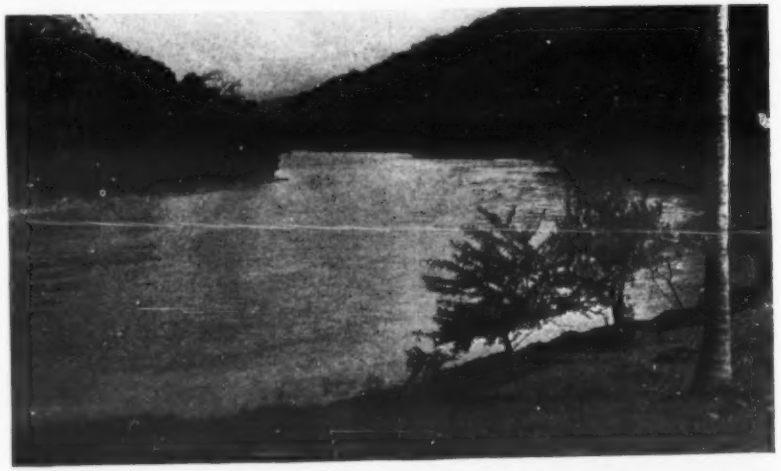
Paramo Zone
- Paramo Fauna

[1] The dotted area is the arid portion of this fauna.

Tropical Zone, Colombian-Pacific Fauna.—(The lower Dagua.) Winds from the sea bring moisture; the annual rainfall here reaches 400 inches. Humidity and isolation have made this faunal area the main local center of adaptive radiation in Colombia

Tropical Zone, Colombian-Pacific Fauna.—(Rio Suclo, altitude 1500 ft.) Primeval forest, and the many bromelias, ferns, and parasitic plants prove abundant rainfall. There is no marked dry season

Tropical Zone, arid part of the Cauca-Magdalena Fauna.—(Western Andes near Antioquia, altitude 2600 ft.) With little vegetation except mimosas and cacti, which add to the desert-like appearance; hemmed in by the Western and Central Andes as with huge walls of pink clay and sandstone



Tropical Zone, Cauca-Magdalena Fauna.—(Puerto Valdivia, on the Rio Cauca.) Forests of the Central Andes rise from the right bank, of the Western Andes from the left. The Cauca and Magdalena valleys are isolated from contiguous faunas by mountain barriers with few passes

Tropical Zone, Caribbean Fauna.—(Coast near Carthagena.) This arid faunal area extends also along the coast of Venezuela. Rainfall is slight and irregular; there are no forests

Tropical Zone, Orinocan Fauna.—(Near Villavicencio.) Open fields, largely under cultivation, and no large forests, but the banks of streams are wooded

Tropical Zone, Orinocan Fauna.—(Near Villavicencio.) The most easterly ridges of the Eastern Andes are covered with primeval woods from base to crest; at their feet stretch the grass-covered level plains—the llanos

Tropical Zone, Orinocan Fauna.—(At Buena Vista, 3000 ft. above Villavicencio.) Richly developed tropical forests, with trees more than 100 feet high, here cover the eastern slope of the Eastern Andes—similar to the Amazonian forests farther south

ridges of the Eastern Andes are covered with primeval woods from base to crest; at their feet stretch the grass-covered level plains—the llanos

490

Subtropical Zone, West Andean Fauna.—(Boquilla Valley from Salento.)—The mountains on the left (west) are the eastern slope of the low Western Andes. On the right (not shown) of the valley towers the lofty western slope of the Central Andes. The Chapman expedition ascended through this Boquilla Valley to headwaters, then up the Central Andes mountain-side, through the forests of the Temperate Zone, to the Paramo Zone of Santa Isabel (12,500 ft. See page 494)

cio.) Richly developed tropical forests, with trees more than 100 feet high, here cover the eastern slope of the Eastern Andes—similar to the Amazonian forests farther south

THE TREE FERN OF HIGH ANDEAN FORESTS

Subtropical Zone, West Andean Fauna.—(View from La Gallera, a camp of government road laborers in the heart of the forest, altitude 7000 ft.)

At the high altitude of the Subtropical Zone (from 4500–6000 to 9000–9500 ft.) there prevail heavy rainfall and high humidity. It is preëminently a zone of forests, with luxuriance in undergrowth. Tree ferns attain a height of fifty feet; there are great tangles of climbing bamboo where orchids and bromelias flourish; everywhere are cushions of green moss; and everything is saturated and dripping with moisture. The life in these forests shows exceptional uniformity, and as a whole has been derived from the Tropical Zone. We found 230 distinctively Subtropical species of birds, and of these 121 are found in the Subtropical Zone of each of the three ranges of the Andes; but the remaining number is so divided as to suggest two centers of adaptive radiation, a West Andean Subtropical Fauna (Western Andes and western slope of Central Andes) and an East Andean Subtropical Fauna (Eastern Andes and eastern slope of Central Andes)

WAX PALMS ALONG THE QUINDIO TRAIL

Eastern slope of the Central Andes (East Andean Subtropical Fauna)

The trail across the Central Andes from the Cauca Valley to the Magdalena Valley over the Quindio Pass has been traveled for centuries. The country along the trail on the foothills of the western slope up to 9000 ft. (beginning of Temperate Zone) is more or less under cultivation. Before reaching this elevation one begins to catch occasional glimpses ahead of the brown paramo and white snowfields of Santa Isabel and Tolima, the latter the highest Andean peak. The divide is passed at 11,500 feet and the descent begun over the eastern slope down to the Magdalena. Wax palms appear on this eastern slope a thousand feet below the divide in the Temperate Zone and are the most abundant tree along the trail down through the Subtropical Zone.

These stately trees, discovered here by Humboldt and Bonpland in 1801, attain a height of from 180 to 200 feet. They are of especial interest to the ornithologist as the home of the yellow-eared parrot (*Ognorhynchus icterotis*). In places along the trail, every palm was occupied by a pair of parrots

CHAPMAN EXPEDITION IN THE HEART OF THE CENTRAL ANDES

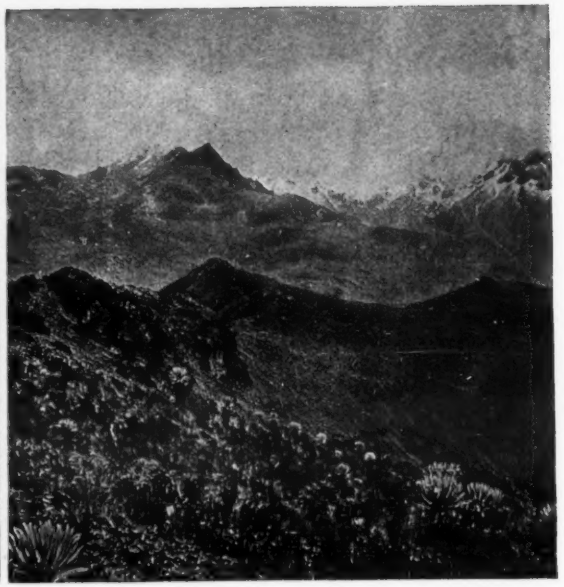
Subtropical Zone, East Andean Fauna.—(View of the Rio Toché from above El Pié de San Juan)

This locality was visited by the Chapman expedition on one of its journeys eastward over the Quindio Trail from the Cauca Valley to the Magdalena Valley. The Rio Toché is here a dashing mountain stream, the home of torrent ducks and dippers. The new yellow-headed finch was found along the trail at this point (see color plate)

Junction of Temperate Zone and Paramo Zone.—(Slopes above Bogotá.) The line of junction between zones is most often sharply indicated, especially on the eastern slopes of the ranges where humidity combines with temperature to mark the boundaries. Occasionally the line of union is very uneven, long finger-like extensions of one zone reaching upward or downward, as the case may be, into another.

Great lack of intercommunication between the various regions of Colombia, even when contiguous, made it necessary for the Chapman expeditions to do most of their work with pack mules and porters

Temperate Zone, showing characteristic trees.—This zone lies approximately between 9000 and 12,000 ft.; the upper limit is likely to correspond with timber line. It is represented in only a few isolated localities on the low Western Andes; it is probably continuous through the Central range; it occupies most of the summits of the Eastern Andes. Conditions in the Temperate Zone are not unlike those of temperate North America, or of South America in Chile and Argentina,—in fact the bird fauna shows close relationship with that of the coast area of southern Chile, as well as with the Subtropical Zone just below it



Paramo Zone, between upper tree line and lower snow line.—(Paramo of Santa Isabel, 12,500 to 15 200 feet, Central Andes.) The Paramo Zone, a land of fog and sleet for many months of the year, has too low a temperature for tree growth. Curious woolly perennials are conspicuous among its flora. The life of the Temperate and Paramo zones shows a uniformity not manifest in lower altitudes; it is not possible to divide these zones into various faunas. The Paramo Zone occurs on very many mountains in the Central Andes; it is lacking in the low Western Andes; it is present on at least twenty summits in the Eastern range

The line separating the different zones is in some places very sharp, particularly on the eastern slopes of the ranges where humidity combines with altitude to make the line between the Tropical and Subtropical zones very distinct. But often long fingers of one zone, for one reason or another, extend into the one above or below so that the line is very uneven. To determine the limits of each zone, as given above, from the nature of its bird life was, therefore, no small task and required innumerable data and specimens before any sort of a map could be charted. The work of previous ornithological explorers was largely unsatisfactory from the standpoint of the present distributional study, because the insufficient or inaccurate data as to the locality where specimens were collected confused rather than assisted. Dr. Chapman had before him, therefore, a work of great magnitude when he began his field operations in 1910, and he is to be congratulated upon the wealth of material which he has brought together and interpreted.

Between 1910 and 1915 Dr. Chapman organized eight expeditions into Colombia, as follows, two of which he himself led:

The first was in the nature of a reconnaissance. Dr. Chapman, accompanied by L. A. Fuertes, W. B. Richardson and Leo E. Miller, entered Colombia at the western port of Buenaventura and crossed the western range to Cali, working at San Antonio at the crest of the western range and then in the Cauca Valley about Cali and La Manuelita, and on the western slope of the central range at Miraflores. Leaving Richardson and Miller in Cali, Chapman and Fuertes continued their survey across the central range over the Quindio Pass to Ibagué and Girardot and then down the Magdalena River.

On the second expedition Richardson and Miller started for Popayán at the headwaters of the Cauca River, whence they worked westward to the top of the western range at an altitude of 10,340 feet and down the western slope of the first ridge, through unexplored country, to Cocal, at an altitude of 4000 feet. Thence they returned to Cali, Richardson to return for a time to Nicaragua.

Third, the writer joined Miller in Cali and we proceeded over the route followed by Chapman and Fuertes in their reconnaissance down the Cauca and over the Quindio Pass, stopping to collect in each faunal zone. This is the main route of travel from the Cauca to the Magdalena Valley, and it might be supposed that the birds along the trail would be very well known. On the contrary, even along this much traveled trail, several birds new to science were found. In ten days' collecting at Laguneta, near the Quindio Pass, thirteen specimens represented two species new to science and others represented subspecies not previously described. Fuertes' parrakeet and Miller's antpitta were both found here. At Rio Toché, just over the ridge, four days' collecting yielded two specimens of the new yellow-headed finch, and at Salento on the western slope, was found Allen's antpitta. All four of these birds are quite distinct species and yet were found at no great distance from the trail.

Returning to Salento on the western side of the central range, we made a side trip to the paramo of Santa Isabel, climbing to snow line at about 15,000 feet and camping for ten days at the edge of timber. Here were found a new goldfinch and a new flycatcher. Again returning to Salento, we retraced our steps to an extensive forest along the Cauca River at Rio Frio and then prepared to cross the Western Andes from Cartago. This was a rather difficult trip as pack animals could not be used, the trail being barely passable for Indian packers. Because of the scarcity of food, the trip over the mountains was made as rapidly as possible, in five days, and some very interesting country unfortunately was left unexplored. Arriving at Juntas de Tamaná, on the Pacific side of the range, we collected here and later at Nóvita and Noanamá, all in the lowlands of the tropical Pacific fauna. The return was then made to Cali.

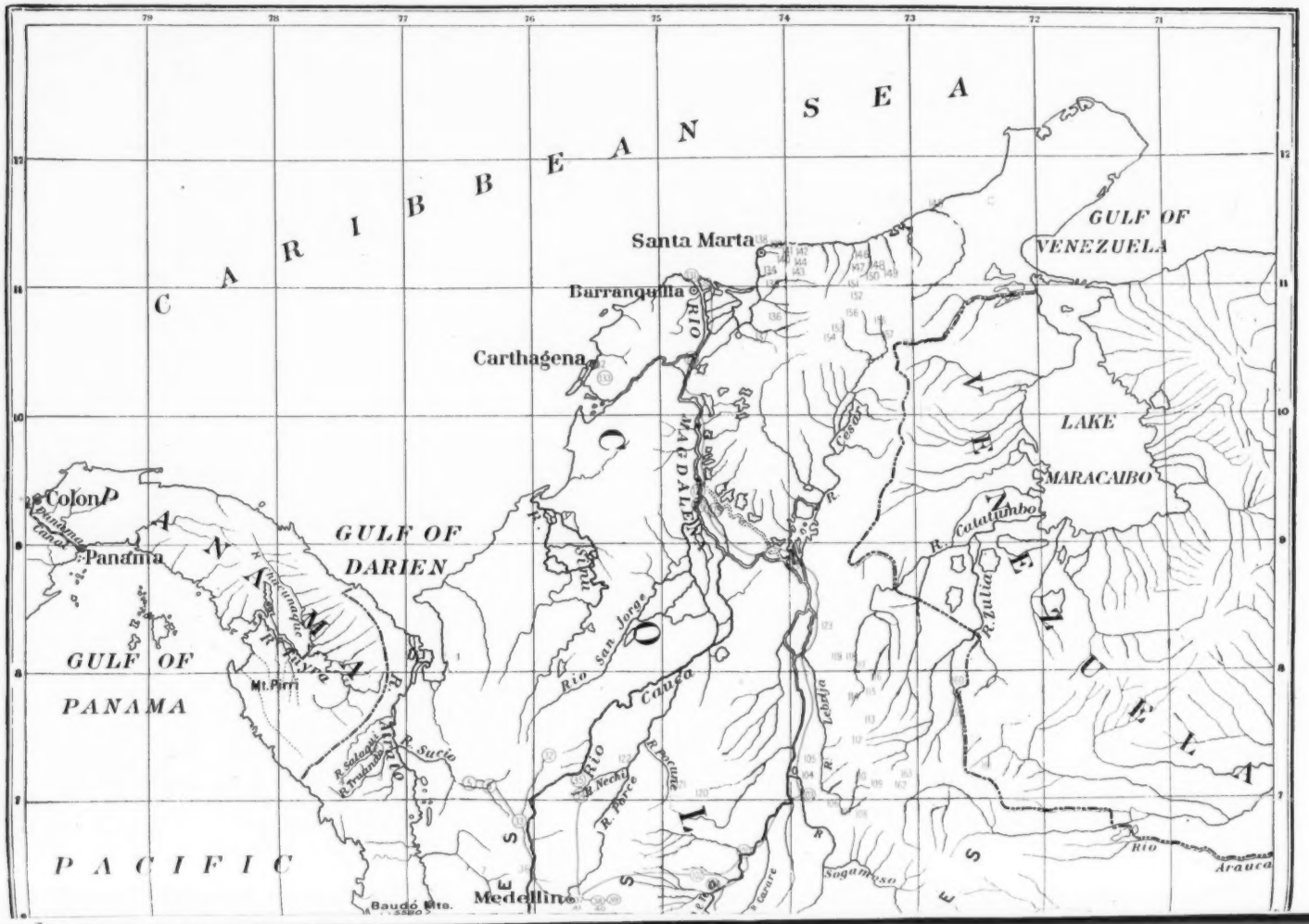
On the fourth expedition Miller and the writer were joined by J. T. Lloyd. The party proceeded from Cali up the Cauca Valley to Popayán and then crossed the central range by way of Almaguer and the pass over the paramo of the Valle de las Pappas to San Augustin. Here fever contracted in the Choco region so weakened the writer that he was compelled to set out for Bogota with Lloyd for medical treatment and thence to return to the United States.

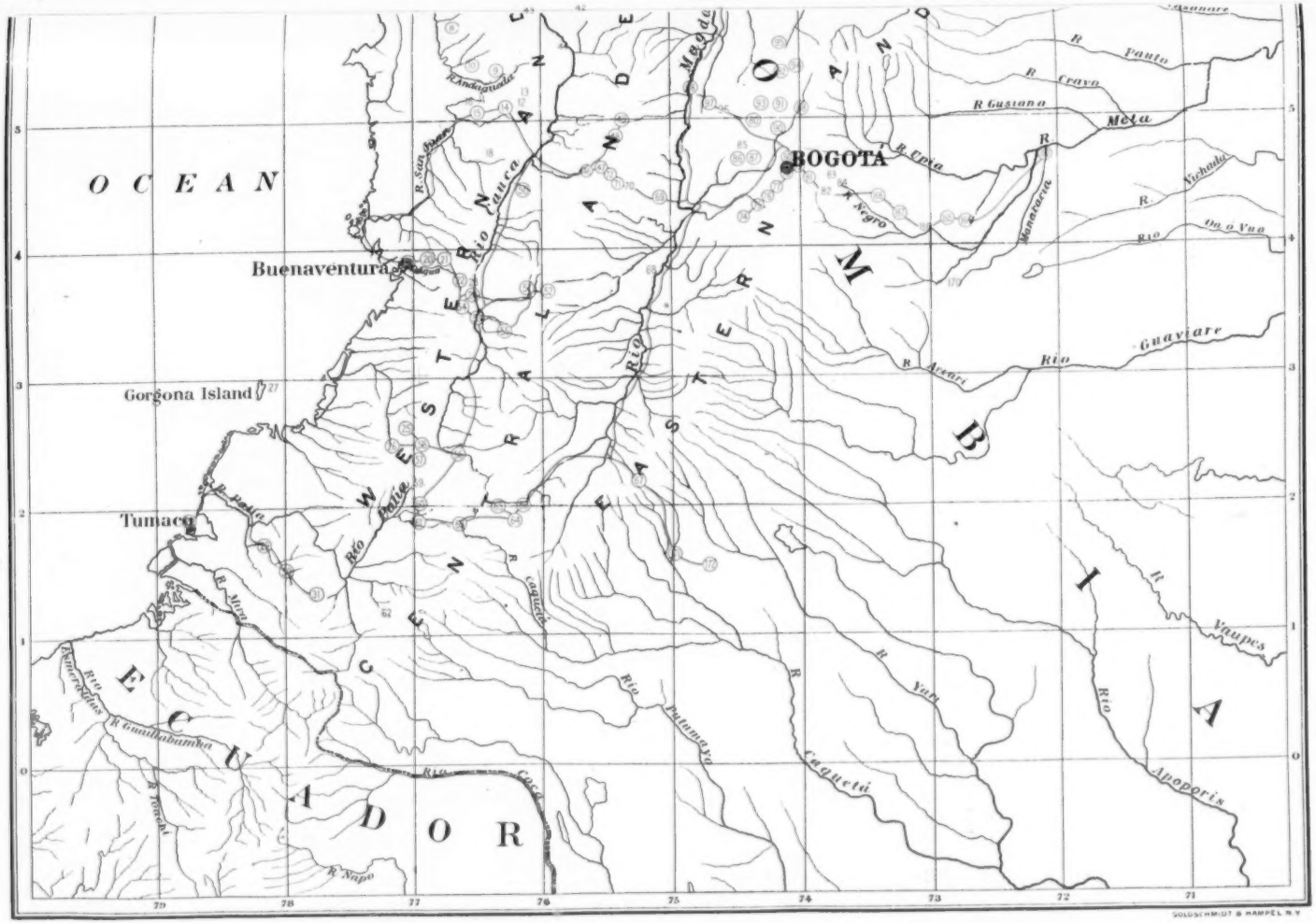
On the fifth expedition Miller proceeded from San Augustin with a native hunter into the Caquetá region, after first collecting near San Augustin where he found the black-headed finch and a nesting colony of the famous "cock-of-the-rock." Miller was the first ornithologist to enter Amazonian Colombia and he did so by crossing the eastern range on the new government road by way of Guadaloupe and Andalucia to Florencia and Morelia.

The sixth expedition was that of W. B. Richardson who explored the tropical Pa-

KEY TO COLOMBIAN COLLECTING STATIONS

Numbers enclosed in circles indicate collecting stations of the American Museum's expeditions; the lines connecting these stations show the routes followed. Lack of space prevents publication of the most interesting 15-page gazetteer which accompanies this map in the *Distribution of Bird-Life in Colombia*, describing briefly the locality at each of the more than 200 stations .





ROUTES OF A ZOÖGEOGRAPHICAL INVESTIGATION OF COLOMBIA

The first aim of the Chapman expedition of the American Museum was to discover the boundaries of the zones and faunas in Colombia determined by temperature and other conditions and manifested by the distribution of birds. And Colombia was chosen for this zoögeographical investigation, first, because of its close connection with North America through the Isthmus of Panama, and, second, because of the great diversity in its climate and bird life

cific fauna. He entered Colombia at the southern port of Tumaco and continued up the Patia River by steamer and canoe as far as Barbacoas and by trail to Ricaurte, seventy-five miles farther inland on the western slope of the western range.

The seventh expedition, led by Dr. Chapman, explored the Bogota plateau and crossed the eastern range, descending to Villavicencio on the llanos. With Dr. Chapman were L. A. Fuertes, G. K. Cherrie, P. G. Howes, G. O'Connell, and T. M. Ring. This was perhaps the most important expedition of all because it gave first hand information of the country whence have been shipped the thousands of bird skins without data, from which so many species have been described. The vast amount of skins shipped by dealers from Bogota, labeled only "Bogota," may have come from any one of four zones and three faunal areas. By means of the fresh specimens collected, Dr. Chapman was able, however, to locate the probable type localities of many species and to escape many pitfalls into which other ornithologists have fallen because of the faded condition of most "Bogota skins." One would not suppose that any species would escape the native hunters after so many years of intensive collecting and yet within six miles of the city in the Suba marshes Dr. Chapman himself discovered a new least bittern and a new yellow-headed blackbird and described a new marsh wren and a new flycatcher from specimens taken by Brother Apolinar, director of the museum of the Instituto de la Salle at Bogota.

The eighth and concluding expedition, composed of Leo Miller and Howarth Boyle, explored the northern end of the central range in the Antioquia region. They crossed the lower Cauca at Puerto Valdivia and worked in the headwaters of the Atrato River at Dabeiba and Alto Bonito. On this expedition, Miller and Boyle likewise explored the little-known Paramillo at the extreme northern end of the western range. Altogether 15,775 skins and valuable detailed data were collected by these various expeditions.[1]

In publishing this work on "The Distribution of Bird-Life in Colombia," Dr. Chapman lays the foundation upon which Colombian ornithology will be built. We cannot praise too highly the ability with which he laid his plans and the care with which he executed them. Those using the volume, whether scientists or laymen, will be delighted with the logical, convenient, and attractive treatment of this difficult subject.

In mentioning those who assisted in this monumental work, the writer believes that Dr. Chapman would feel that a serious omission had been made in this review if a conspicuous place were not given to his acknowledgments. We can, therefore, do no better than to quote some of his own generous words:

> We should indeed be lacking a sense of appreciation if we did not express our gratitude to the people of Colombia with whom at one time or another and in a thousand nameless ways, we have come in contact. From the peon by the wayside to the owners of haciendas one and all have shown us the most courteous attention.
>
> When traveling through remote, unsettled regions with a valuable outfit and often considerable sums of money, we have felt as safe (possibly safer!) as when in our own homes. When in camp or at hotels, country inns or *posadas*, we made no special provision for guarding our equipment and supplies; nevertheless, during the five years of our work we did not suffer the loss of a single item by theft. Indeed, on passing through a certain village where one of our party had previously worked, we were stopped by a native bringing a needle and thread which had been left behind!
>
> But especially do I desire, so far as mere words will permit, to pay a tribute to the men with whom it has been my privilege to be associated on our zoölogical explorations in Colombia: To William B. Richardson, Louis A. Fuertes, Leo E. Miller, Arthur A. Allen, George K. Cherrie, Paul G. Howes, Geoffroy O'Connell, Thomas M. Ring, and Howarth Boyle. To their untiring enthusiasm and whole-souled devotion to the American Museum's interests may be credited the most valuable collections of birds and mammals which have been brought from any part of South America.

The success of any great undertaking depends not only upon the strength of the leader but upon his ability to draw from his assistants the best that they have to give. In this particular Dr. Chapman has no peer, and what help he received from others is in large measure but a further tribute to himself.

[1] Dr. Chapman had access also to collections made by Mrs. Kerr in the Atrato drainage and Smith's collections in the Santa Marta region. From the standpoint of distribution, however, as before stated, the reports of previous ornithological expeditions, with few exceptions, are of little value. Salmon's collections in Antioquia about Medellin, reported on by Sclater and Salvin, are an exception as is also the collection of the Michler expedition in the Atrato, reported on by Cassin. Palmer's collections about Cali and in the Choco and Carriker's work in the Santa Marta region should also be mentioned.

A NEW MOUNTAIN PARRAKEET

About one half natural size

Fuertes' Parrakeet, *Hapalopsittaca fuertesi* (Chapman), a new species collected by one of the Chapman Expeditions at 10,340 feet elevation, near Quindio Pass, Cauca, Colombia.

Of the 1285 species, 61 families, described in Chapman's *Distribution of Bird-Life in Colombia*, all were collected by the Chapman Expeditions. These 1285 species of birds, with the exception of 45 North American migrants, are permanent residents of Colombia. Of this family of macaws, parrots, and parrakeets (Psittacidæ), there were 31 species collected, most of them living in low altitudes; 22 species in the Tropical Zone, 6 in the Subtropical, 2 including the new species in the Temperate, and none on the Paramo.

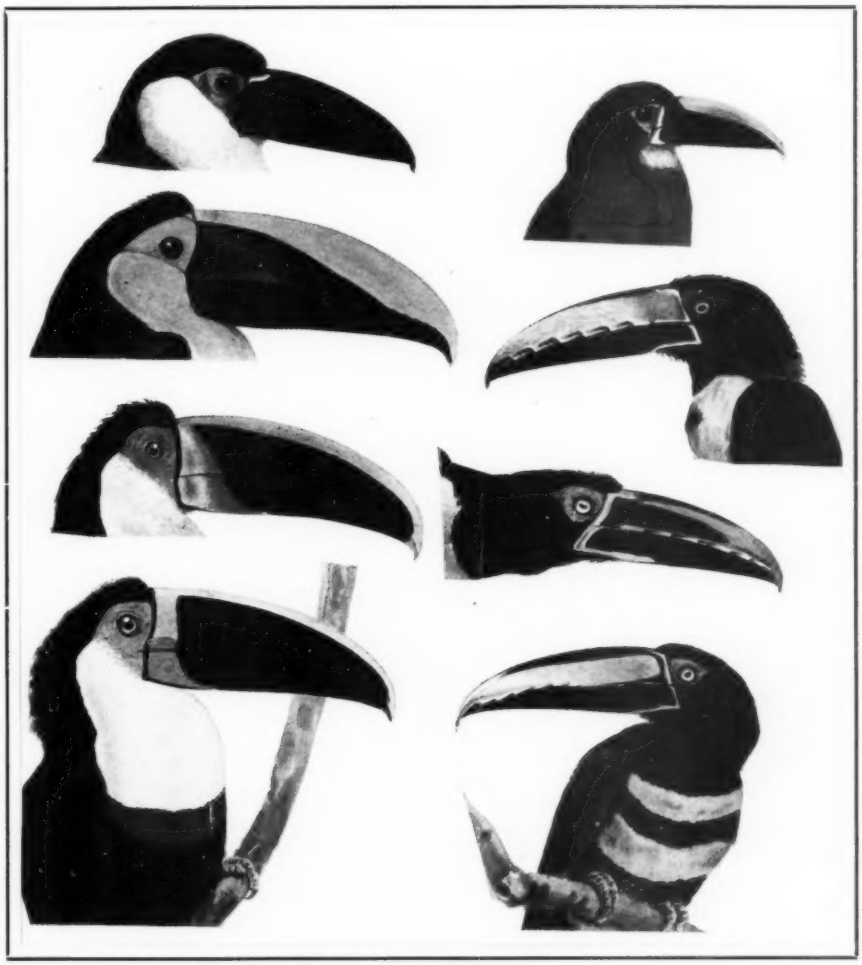
The new parrakeet (there were 7 specimens taken) was named in honor of the artist, Mr. Louis Agassiz Fuertes. The lower figure shows the plumage of the immature bird

NEW FINCHES OF COLOMBIA

One half natural size

Yellow-headed and black-headed finches (*Atlapetes flaviceps* Chapman and *Atlapetes fusco-olivaceus* Chapman) are two of the 22 species and 115 subspecies described as new to science in Chapman's *Distribution of Bird-Life in Colombia*. That so large a piece of systematic work on new forms was possible is owing in part to the very large collection brought together which allowed comparative study. The yellow-headed finch was found along the Rio Toché at an altitude of 6800 feet on the Quindio Trail of the Central Andes, and the black-headed species came from San Augustin, altitude 5000 feet, Huila, Colombia.

Of the family of finches(Fringillidæ), more than 60 species were collected in Colombia. The birds are distributed throughout the four life zones, but with a diminishing number of species as the altitude increases; namely, 35 species in the Tropical Zone, 17 Subtropical, 11 Temperate, and 2 Paramo



PORTRAITS OF FRUIT-EATING BIRDS OF COLOMBIA

About one quarter natural size

These toucans of Colombia were drawn in color by the artist of the expeditions, Mr. Louis Agassiz Fuertes, directly from the freshly collected specimens. The bird at the upper left corner is described by Dr. Chapman as new. Twenty-three species of this family (Ramphastidæ) were collected by the Chapman Expeditions; 17 species among the 23 are characteristic of tropical Colombia, while 7 species belong in the Subtropical Zone, and one is found in the Temperate Zone. The birds whose portraits are shown live in the Tropical Zone except the upper two which are Subtropical.

The species above are as follows:

Andigena nigrirostris occidentalis Chapman
Ramphastos swainsoni Gould
Ramphastos citreolæmus Gould
Ramphastos culminatus Gould
Aulacorhynchus albivitta albivitta (Boiss)
Pteroglossus torquatus nuchalis Cabanis
Pteroglossus castanotis castanotis Gould
Pteroglossus pluricinctus Gould

TWO NEW ANT THRUSHES

One half natural size

The more evenly colored bird is Miller's antpitta (*Grallaria milleri* Chapman), named in honor of Mr. Leo E. Miller of the American Museum, and was found in the Temperate Zone at 10,300 feet, near Quindio Pass, Cauca, Colombia.

The lower bird is the second new species, Allen's antpitta (*Grallaria alleni* Chapman), a discovery made while the Chapman Expeditions were working in the Subtropical Zone at Salento, altitude 7000 feet, in the Central Andes. This species was named after Mr. Arthur A. Allen, of Cornell University.

Of the family of ant thrushes (Formicariidæ), the expeditions collected 83 per cent of the 124 species known in Colombia. These small active birds living in dense undergrowth are more difficult to study and collect than even the humming birds. The various members of the family are distributed throughout the four life zones, but with far the greatest number in the Tropical Zone; namely, 82 species, Tropical Zone, 17 Subtropical, 7 Temperate, and 1 Paramo

Hidden Wealth in British Guiana

By WILLIAM J. LAVARRE, JR.

ON the northern coast of South America lies British Guiana, topographically varied by rivers, jungles, mountains, and savannahs, each of which may some day furnish the world with products of much value. The rivers are capable of turning great electrical dynamos; the jungles contain vast quantities of lumber, and both jungles and mountains contain aluminum, to say nothing of other mineral probabilities; the savannahs can be converted into grazing lands for cattle, while the opening up of the railroad from Brazil to Georgetown and the dredging of the harbor of Georgetown, puts the colony into commercial relations with the outside world. Gold and diamonds are now being found in secluded places in British Guiana. Much gold has already been taken, and in the days to come valuable diamond deposits may be discovered.

The Mazaruni River rises in the central part of the colony, flows northwest around the Merume Mountains and then back northeast, emptying into the Essequibo at Bartica—where Kalacoon, the biological station of the New York Zoölogical Society, is located. This river affords the principal field for diamond exploitation. The region, which lies fifty miles from Bartica and extends one hundred miles farther into the interior, has been scantily prospected by a group of harum-scarum men locally termed "pork-knockers." They know no system in their prospecting, but move about here and there in the wake of such of their group as chance to make a discovery of any value.

As yet few deposits of any size have been located; the diamond-bearing gravel does not seem to run in mother lodes, but is scattered over the country in potholes. Only one mine has been established, and this, both because of the nature of the place and the primitive methods employed, has not proved a success.

Nevertheless, there is shipped to England each year a quantity of diamonds which are the direct result of the labors of these pork-knockers. The men go into the bush in small groups or alone, and scrape the gravel from the shallow creek beds, or perhaps dig one or two feet into the gravel banks of the forests if it seems profitable. They are a happy-go-lucky lot of men, of either Dutch and Indian or Negro lineage. They gather together at Bartica, the outermost point of

Not only is traveling up the rapids of the Mazaruni River very difficult, but the climate is humid, and malaria and black water fevers tax the endurance of prospectors and laborers. Provision boats (these are made of heavy greenheart wood) must be unloaded before they can be drawn through the rapids, while the provisions are carried around the rapids on land. Such scenes as this are typical of the jungle interiors almost anywhere in the Mazaruni District of British Guiana during the dry season

civilization, and await the departure of some prospecting party that requires extra paddlers, or of the supply boat going to the numerous trading posts in the mining districts. These trading posts carry a supply of foodstuffs and gin (sad to say, mostly gin), which is sold in exchange for the diamonds of the pork-knockers. By these boats the men work their way into the diamond fields; serving as paddlers, and toiling all day long for several weeks, they reach their destination, having earned in addition one week's supply of rice, salt fish, salt pork, sugar, tea, and flour. They do not carry provisions with them from Bartica, but depend upon this supply to last them until they can unearth enough stones to pay for the next week's rations—and so on each week.

The one diamond mine established in British Guiana was equipped very little better than are the individual prospectors, or "pork-knockers." Enough gravel for two or three days' sorting was brought from the mine to the washing beds. A trough having strainers of different-sized mesh was used for the first rough sorting out of the coarser stones from the gravel, after which it was turned over to the jiggers. This mine has since been deserted, as working it without proper equipment proved a failure

Their prospecting is begun most often in some shallow creek bed. Those who are more fortunate in the possession of implements may be able to make enough each week to pay for their provisions and leave a profit, but most of them make barely enough to buy their provisions, and often have to go into debt during many weeks before they make a find of any important size. Implements usually consist of an ax, shovel, pick, bucket, and a round sieve used for separating the diamonds from the gravel.

A party I once chanced upon was illustrative of the average group that one might meet in the bush. A negro (giant in size and clad only in a loin cloth) stood knee-deep in the creek and with a long-handled shovel filled the bucket with small gravel. The boy who held the bucket carried it to an old man (picturesquely gray-haired and with exceedingly large and knotted forearms) who did all of the "scientific part" of the work—that is, the jigging of the gravel in the round sieve. Diamond production depends largely upon the abilities of the jigger; if he be careful and know his work there will be no loss. This man was very careful and experienced; in

Two steps in the process of separating the diamonds from the gravel.—The man at the right is swirling some gravel in his sieve to send the diamonds to the bottom. The other man is scooping out of his sieve the top layer of residue gravel from which the diamonds have been jigged to the lower layer. A careful jigger rarely loses a diamond from the mass of gravel

fact, as I learned later, his ability was so marvelous that instead of making the diamonds go to the bottom center as he should have done, he often brought them to the top and picked them off for himself.

When I first saw him he was at work, stooping astride a pool about three feet across and two feet deep. By a series of calculated motions he attempted to form a centrifugal force which would serve to center the heaviest material in the bottom of the sieve, and as diamonds are the heaviest of the pebbles, they naturally are the first to respond to the movements. Where diamonds are found, there are likely to be also tin, carbon, and pulsite, mixed with quartz. These minerals are heaviest next to diamonds, and are therefore also sent to the bottom.

The sieve filled with gravel was lowered into the water and turned from left to right while kept in a level position. Then it was quickly lowered and raised in the water and shaken from side to side while being turned around. Finally, it was swung around while tilted. After a few minutes of such work, the man scooped up the top gravel and threw it away; then he added new gravel to that left in the sieve, and repeated the operation again and still again for an hour. By this time, there was left in the sieve only black carbon, brown pulsite, and a small center of tin, in which the diamonds, if any, were to be found. The sieve was now turned upside down on a piece of level canvas stretched out on the ground by means of pegs. From the middle of the overturned residue, he picked out a small but perfectly shaped diamond of one half carat. That stone I have with me today as a reminder of the first time I ever saw a diamond taken from the soil.

Diamonds are easily identified in the raw state by their peculiar sheen and shape, but if there is any doubt about the stones, the matter can be decided by subjecting them to pressure between two knives. Anything except a diamond can be crushed. In color they vary from white to pink, blue, yellow, green, and black. Their shapes range from spherical to flat, and include some nearly perfect diamond-shaped gems. A few stones which I saw were so perfect, both in shape and color, that it was difficult to believe they had not been cut and polished by machinery. The largest stone on record for this region weighed fourteen carats; it was found by a pork-knocker named London, who, because of his great size and strength and previous lawless acts, was feared by the other bushmen. At that time he was working for another man, and strange to say, contrary to the precedent set by his previous life, he turned the stone over to his employer. I chanced to meet him afterward in the interior and asked him how it came about that he did not keep the stone for himself. With an unlooked-for show of eloquence he said, "Give unto Cæsar what is Cæsar's, and unto God what is God's—anyway he be too beeg a stone for one fellerman to steal." His employer probably never would have seen the stone if it had been a mere five carats, but for once London had been scared into honesty.

The one mine that the colony had, the "Le Desire," was located in the alluvial deposits in an old bed of the Mazaruni, about two hundred miles within the forest. The river had changed its course since depositing this sixty-foot pile of diamond-bearing gravel, which with age had conglomerated, and on

After the gravel has been worked down to a very thin layer made up of a brown stone called pulsite, small particles of tin, pebbles of carbon, and any possible diamonds, the sieve and its contents are turned upside down on the sorting table. The biggest diamonds are usually found right on top in the middle of the heap. With the point of a knife, the sorters flip each pulsite, tin, and carbon pebble, one by one, from the mass, leaving the diamonds on the mat

top of which giant trees had grown. For the working of the mine, the land was cleared of trees which later furnished the beams for the shafts. Water was encountered when the work had progressed twenty feet below ground and a diaphragm pump was used. In time, however, the water increased and made conditions so bad that the work had to be continued at another side.

The only difference between the process

British Guiana has already yielded gold-bearing material. The gold miners have a simple way of washing earth supposed to contain gold. The dirt is put into a shallow conical-shaped wooden bowl called a *batea*, which is then slewed about in the water with a circular sidewise motion. A bit of quicksilver in the apex of the cone mingles with the dirt and attaches to itself whatever small particles of gold are present; then, being heavier than the dirt, it sinks back to the bottom again. The earth is gradually washed away by the action of the water and the gold and quicksilver are left in the *batea*

of getting the diamonds from the gravel in the mine and the way in which the work is usually done by pork-knockers, was in the washing of the gravel in "long toms," and the employment of several jiggers instead of one. Of course there was also the advantage that came from good tools for the work.

The "long toms" were long troughs placed at the outlets of a dam in the creek. In each trough were inserted three sieves of different-sized mesh. The gravel was dumped into the upper end of the trough and washed down by the pressure of the water coming through from the dam above. The larger stones and gravel were kept back and thrown away. After passing through the "long tom," the gravel of uniform size fell into a rectangular flat sieve that was suspended by four chains from a scaffolding in such a way that the water in the pool below just covered the bottom of the sieve. A man stood in this water and shook the sieve (locally called a "baby") back and forth. This gave the finishing touches to the washing. Then the gravel was brought to jiggers, and they jigged it in large square boxes which had been filled with water after the seams had been stopped with rags and rubber.

This mine undoubtedly has some valuable material in it, but on account of the looseness of the gravel which causes cave-ins, and the presence of an excess of water, it has proved a failure as worked. Supplies had to be brought up the river from Georgetown, and as the river has many rapids and falls, much hauling and portage was necessary. The only pump that could be had in Georgetown was too small to serve the emergency at the mine, as it could draw up water only twenty feet, and the place has finally been deserted. The buildings by this time have probably disappeared, each board being carried away separately by passing pork-knockers, or by those who came especially to get them. Boards are scarce there, and it could not be hoped that such an unguarded supply would remain long.

These diamond gravels, however, are a valuable asset of British Guiana. Even by their primitive methods, the pork-knockers have enriched the colony by hundreds of dollars collected as royalties, and have put upon the market many fine gems, besides much bort or chips and small stones, used in British manufacturing plants where highly polished surfaces of steel are required. Labor is cheap in British Guiana, from forty-eight to seventy-two cents a day. The men are registered by the government for a period of one hundred and twenty working days and are forced by law to serve the full time.

Both diamond and gold-bearing material is here, to be profitably, if scientifically, explored and prospected, for this interior of jungle, savannah, and mountain represents one of the least known places of the world.

A New Edible Shad

By EMERSON STRINGHAM

Scientific Assistant, United States Bureau of Fisheries

POSSIBLY the cynics may find grist for their mill in this situation. The shad, which on the Atlantic coast is almost as much sought after as Kipling's "Old Man Kangaroo," is despised on the Mississippi River. It adds to the humor of the situation that an effort was made forty-five years ago to introduce the Atlantic coast shad to the great river. The inland fish is not identical with the coast species but it is so much like it that the two were confounded by scientists, and there are now specimens in the National Museum which were wrongly identified as the coast species. Because it was first scientifically described from Ohio River specimens, the fish is called Ohio shad (*Alosa ohiensis*). But it was taken in numbers from the Mississippi River at Keokuk, Iowa, in 1914 and 1915.

There are three forms living with the Ohio shad which may be confused with it. There is no occasion for confusing it with the gizzard shad or mud shad (*Dorosoma cepedianum*) which is found principally in quiet waters and has a very small mouth. The mooneyes are easily distinguished by the absence of sawlike scutes along the ventral edge. To distinguish the Ohio shad from the river herring (*Pomolobus chrysochloris*) requires more care. In general appearance the two fish are similar, but the herring has a protruding lower jaw, as shown in the illustration. By opening the mouth the gill arches may be seen and these are entirely different. The herring has from 30 to 54 rakers in the outer arch, and the raker at the angle of the arch is between one fifth and one twelfth as long as the head; the larger number and greater relative length are found only in young fish. The shad, of which only adults have been examined, has from 60 to 75 rakers in the outer arch, the one at the angle being about one quarter as long as the head. A third distinguishing feature is the color of the tip of the lower jaw, which in the herring is olive in life (blackish in preservative), while in the Ohio shad it is pink (straw color in preservative).

The describer of the fish, Dr. B. W. Evermann, stated that those who are familiar with the Atlantic shad find this one not at all inferior, and the present writer is able, from repeated trials, to concur in this opinion. Although eaten to some extent along the Ohio River, this fish seems never to be used on the Mississippi. Several people living in Keokuk were persuaded to try it and one restaurant served it for part of a day. But it was uniformly condemned because of its bones, although it is certainly no worse

Catching the "Ohio shad" in a trammel net near the Keokuk dam on the Mississippi River. This shad, which reaches a length of nearly two feet and weighs from one to three pounds, is quite as palatable, either fresh or smoked, as the much prized Atlantic variety

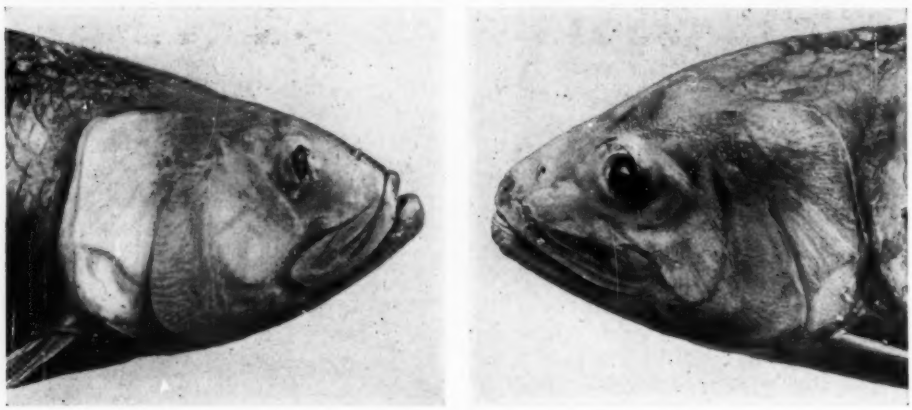
in that respect than any other shad. The smoked fish, however, was generally acknowledged to be delicious; bones are less troublesome in smoked fish. Another reason why the fish is neglected is that the fishermen confuse it with the river herring, which is an excessively thin and tasteless fish, so that anyone trying it would be likely to denounce the whole tribe.

During the course of an investigation of the relation to the fisheries of the huge dam and power plant at Keokuk, the opportunity to examine specimens of Ohio shad presented itself. They measured from 16 to almost 20 inches in length and weighed from 1 to 3 pounds. The structure of the mouth parts indicates that the food consists of buoyant organisms strained from the water. Stomachs of more than 150 were examined and most of them were wholly empty, but about 50 contained remains of hard parts of insects, or fragments of vegetation. A further indication that they do not feed regularly at this stage of their life is furnished by the fact that they are rarely, if ever, hooked by anglers. Examples are occasionally found in fyke nets, but the usual implement of capture is the drifted trammel net, which takes these incidentally. It seems that they swim near the surface although there is no quantitative evidence on the point.

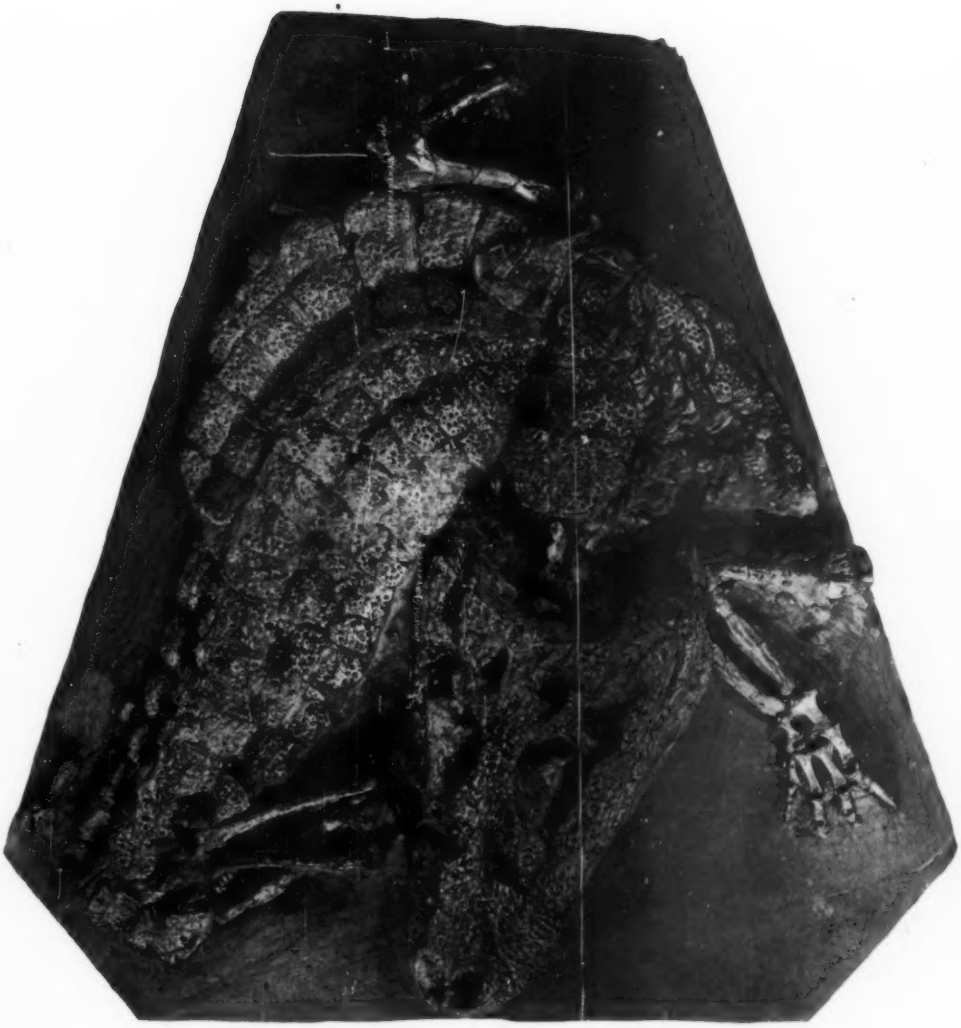
It has been assumed that the fish is anadromous, spending part of its life in salt water and part in fresh—principally because of its close relationship to known anadromous species. The most serious objection to this view is the fact that it is found so far from salt water. Observations made during 1915 and 1916 tend, however, to confirm the assumption that it passes down to the sea. In the former year it was present at Keokuk, about a thousand miles from the Gulf of Mexico, from the first of May to the middle of July, and at no other time. In 1916 it was a much rarer fish and was taken from the middle of May to the end of June. Among all examples dissected no spawned-out fish were found; the absence of spent fish is not surprising as Keokuk is the upper limit of migration since the building of the dam. Somewhat farther down the river it should be possible to get such fish. The spawning period appears to be early summer.

It is by no means certain that the Ohio shad is abundant enough to sustain a considerable fishery, but it is desirable that those which are taken should be utilized. The United States Bureau of Fisheries is planning propagation on the Ohio River where they are now used.

If a market of any extent develops, it is to be expected that other fishes will be sold as Ohio shad. The mooneyes are themselves good eating; the other possible substitutes should not be sold at shad prices. A reasonably safe rule for the inexperienced purchaser is to accept only fish weighing one and a half pounds or more, as the four other kinds rarely attain this weight and the adult shad nearly always exceeds it.



The river herring (left), a thin and tasteless fish, is caught in the nets with the Ohio shad (right) and is confused with it in the market. The shad is quickly distinguished, however, by its short lower jaw, as well as by the greater number of gill rakers. This confusion is probably one explanation of neglect to utilize this excellent food fish of the Ohio and Mississippi rivers



An unusually perfect skeleton of an alligator discovered by Mr. H. F. Wells some years ago in the Tertiary formation of the Big Bad Lands in South Dakota and only recently extracted at the American Museum from the rock in which it had lain imbedded so many thousands of years. Alligators are found at present only in southern United States, Mexico, and China. Very little has hitherto been known as to their geological history. This is a rather small specimen, probably not full grown. The lower jaw measures 9½ inches in length

A Tertiary Alligator

CROCODILES have narrow and triangular skulls with a notch on each side into which fits the large fourth tooth of the lower jaw. In the alligators and caymans the head is broader and flatter and the notch is lacking, the lower tusk fitting into a socket in the upper jaw. Crocodiles are found in nearly all tropical countries, but alligators only in the southern United States, Mexico, and China, and caymans in South and Central America.

Numerous fossil crocodiles have been found in the Tertiary and older formations of various parts of the world, but hitherto

nothing has been known about the geological history of the alligator. One of the American Museum expeditions of 1916 found remains of a true alligator in the later Tertiary of Nebraska, and a fine specimen here figured from the middle Tertiary of the Big Bad Lands of South Dakota also proves to belong to this genus; although in some respects it is intermediate between modern crocodiles and alligators. It thus appears that there were true alligators in North America as early as the beginning of the Oligocene epoch. Many skulls of crocodilians from the older Tertiaries of this country have been found, but so far as known there were no alligators among them; most of them were true crocodiles but there were at least two peculiar extinct genera.

It seems probable, therefore, that the alligator invaded this country at the beginning of the Oligocene or middle Tertiary along with the numerous kinds of mammalian quadrupeds that suddenly appeared at that time. Where they came from is not so certain; perhaps from the northern parts of North America, but probably ultimately from some part of central or northern Asia. The earlier ancestry of the alligator is one of the many problems for the solution of which we may look to explorations in China and Central Asia after the war has come to an end.

The specimen here figured was collected by Mr. H. F. Wells in the Big Bad Lands some years ago, but has not until now been extracted from the matrix. It is an unusually perfect skeleton, although lacking the tail, and is probably the same species as the *"Crocodilus" prenasalis* described by Dr. Loomis [1] in 1904, from a part of the muzzle and other fragments.—W. D. M.

[1] Two New Reptiles from the Titanothere Beds, by F. B. Loomis, *American Journal of Science*, 4th series, Vol. XVIII, Dec., 1904, pp. 427–432.

Charles Rochester Eastman (1868-1918)

DR. EASTMAN was associated with the American Museum since 1915, and under his learned editorship there appeared from the Museum press two volumes dealing with the literature of fishes which included the collation and revision of about fifty thousand titles,—a labor the patient magnitude of which cannot be measured readily. For the accomplishment of this task Dr. Eastman brought into play an extraordinary range of attainments: he had had the training of Harvard, had studied at Johns Hopkins, and had taken the degree of doctor in philosophy at Munich; he was a gifted linguist (our references deal with about eighteen languages); he was an accomplished ichthyologist, familiar with the literature of the fishes through years of research; and, possibly best of all for our purpose, he was a devoted bibliophile, which enabled him patiently to consider the ways and means of obtaining out-of-the-way references to make our series complete. In fact, in this regard, he had for our particular subject the zest of the amateur who captures a rare specimen, or of a collector of paintings who discovers under concealing varnish the name of an early master. For this labor, then, the thanks of students of fishes will ever be given to Dr. Eastman.

As an ichthyologist, Dr. Eastman had devoted himself since 1893 to the study of the older groups; and to our knowledge of fossil fishes from all horizons, he contributed about one hundred papers. His first publication dealt with certain sharks of chalk times. This led him to trace back the earliest sharks, especially those of the Devonian age, and these in turn introduced to his critical eye a group of contemporary fishes known as "placoderms," whose forms and relationships have ever been puzzles to students. By some they have been recorded as masquerading sharks, by others as highly modified lung fishes, by still others as curious offshoots of a race of fishes older and more primitive even than sharks. Dr. Eastman studied the remains of these early placoderms with the greatest zeal and skill. He examined collections from all parts of the world; he described new forms and he traced their kinships, root and branch. His keen eye associated the tattered bits of these earliest creatures and presented them to us almost as living fishes. His skill in this interpretation was almost uncanny, and stu-

dents of fossil fishes will ever appreciate his clear descriptions and the light which he cast upon the tangled kinships.

His work also as a reviewer and memorialist should be mentioned. He had a distinctly literary gift and his work appeared in a form and with a finish by no means common in science. As a teacher he was precise, although his main service in this field was less to individual students than to those he helped by his translation of the work of his old preceptor, Professor Karl von Zittel.

During the last decade Dr. Eastman gave his attention largely to the history of the recent fishes. He had been the means of bringing to the Carnegie Museum a remarkable collection of these forms from Monte Bolca, and during his sojourn in Pittsburgh he published a descriptive catalogue of them together with various special memoirs. So too in his last years he gave free rein to his love for Greek and Roman literature. He was a constant reader of the natural history of the ancients and was probably better informed in this field than any living author.

Dr. Eastman's death was a tragic one. Anxious to help in the war, he had relinquished his work in the American Museum and had associated himself with the War Trade Board in Washington. Here he had worked assiduously for several months. He returned to New York for a brief rest, was attacked by the present epidemic of influenza, and had gone to Long Beach hoping for a speedy recovery. On the evening of his arrival, September 27, although suffering with fever, he left the hotel to take the air on the board walk. So far as can be ascertained he wandered away from the lighted part of the walk and fell either from the edge of the walk where the rail was broken, or between loosened boards. The sea was rough and at that hour the tide extended well beyond this dilapidated end of the walk, so that in the fall it appears that he was stunned and carried out in the surf. It had been the hope of Dr. Eastman, as well as of the authorities in the Museum, that at the conclusion of his work for the United States Government, he would return to the Museum and take in charge the editing of the index volume of the *Bibliography* to which he had given the last three years of his life.—BASHFORD DEAN.

Minerals That Are Helping to Win the War

(An Exhibit in the Hall of Minerals at the American Museum)

THOSE of us who are constrained to view the amazing spectacle of the World War from this side of the Atlantic are increasingly conscious of the far-reaching effect of this supreme struggle upon every phase of industry and production. New and vital problems along many lines present themselves for solution almost daily.

In few phases of the question of production are the conditions more pressing than in that which concerns the supply of raw materials for the manufacture of munitions of war. The term "war minerals" has recently been applied to the ores which produce the metals used in the making of ammunition, ordnance, armor plate, special forgings for motor parts, as well as those essential to the production of tools and apparatus.

These basic elements of our war machinery are featured in a series of war minerals and their products just put on exhibition in the hall of minerals at the American Museum. So far as possible this series aims to visualize the steps in the development of war munitions, from the ore to the finished product, and to emphasize the need of establishing an adequate domestic source of supply of ores of the rarer metals, such as mercury, nickel, manganese, chromium, tungsten, vanadium, and molybdenum.

Under each group of ores and products in the exhibit the application of the given metal or mineral to its specific war industry is indicated, as in the case of molybdenum steel, used in the inner tubes of large guns, which "resists the erosion of the gases developed by smokeless powder."

Small maps displayed with each mineral in the exhibit show the occurrence of the ores in the United States, and are accom-

panied by statements of the principal sources of the world's supply prior to the war. Specimens of the foreign ores and of the occurrences which might, under favorable circumstances, be developed in this country, emphasize the vital need as well as the possibilities of domestic production.

It is in the display of the finished products of the war industries, however, that the exhibit makes its distinct appeal to the public. Through the courtesy of a number of prominent manufacturing firms, material has been made available which shows how minerals, and metals extracted from minerals, are being turned into the tools of our fighting Army and Navy. In this way one may see the sectional barrel of that very efficient eliminator of submarines, the three-inch naval gun, with its lining of molybdenum steel, designed to resist the corrosive action of smokeless powder, or can trace the application of mercury from cinnabar, its ore, to the primers charged with fulminate of mercury which explode the hand and rifle grenades now being used to push forward our fighting line in France and Alsace.

One of the most complete series in the exhibit is that which shows the many stages in the manufacture of the nickel-jacketed bullets which are now being dispatched, millions in number, from the rifles, machine guns, and revolvers of our Army and of those of the Allies. These are assembled in a number of mounts which show, step by step, the evolution of a cartridge from a meaningless bit of metal to the smooth, slender-pointed engine of war. A significant detail in the manufacture of the .303 caliber cartridge used in the Lee-Enfield rifles of the British Army, is the little "U. S." which is stamped on the lead insert of the bullet before it is assembled in the shell.

On the whole, the "war minerals exhibit" has already proved its popularity, judging from the numbers of both soldiers and civilians that have been attracted by it, and it is to be hoped that it will have considerable influence in bringing to the front of public interest a phase of our war production which is of primary importance in this period of more than usually important things.—HERBERT P. WHITLOCK.

Notes

SINCE the last issue of the JOURNAL the following persons have been elected members of the American Museum:

Life Members, MESDAMES GEORGE E. CHISHOLM, PHOEBE A. HEARST, LINDA V. MALLINSON, AUGUST R. MEYER, MORTON F. PLANT, BENJAMIN STRONG, JR., MISS ALTHEA R. SHERMAN, DR. ALEXANDER HAMILTON RICE, THE HON. ROBERT WORTH BINGHAM, THE HON. A. BARTON HEPBURN, MESSRS. C. F. AHLSTROM, D. NEWTON BARNEY, M. L. BYERS, FULLER E. CALLAWAY, HAMILTON CARHARTT, R. T. CRANE, JR., JOHN T. DAVIS, GEO. W. HOADLEY, R. L. IRELAND, FRANK J. MYERS, HERMAN ARMOUR NICHOLS, HENRY D. SHARPE, E. A. CAPPELEN SMITH, WILLIAM C. SQUIER, 3D, and A. F. TROESCHER.

Sustaining Members, MESDAMES S. S. MERRILL, GEORGINE HOLMES THOMAS, MESSRS. WALTER B. CONGDON, R. D. BENSON, JESSE H. JONES, GEO. A. MCKINLOCK, and C. J. ULMANN.

Annual Members, MESDAMES SAMUEL W. ALLERTON, CAROLINE S. CHOATE, CHARLES M. CLARK, CEASAR CONE, A. P. L. DULL, R. M. GALLAWAY, J. W. GATES, ARTHUR LEE, JOHN MARKLE, GIFFORD PINCHOT, ROBERT W. SAYLES, VICTOR MORRIS TYLER, MISSES VIRGINIA SCOTT HOYT, MARIE C. JERMAIN, ETTA LASKER, GEN. J. FRED PIERSON, THE REV. IRVING C. GAYLORD, THE REV. ARTHUR R. GRAY, DR. SVEN GERTZON, MESSRS. ERASTUS W. BULKLEY, HARRY CHANNON, JOHN S. ELLSWORTH, ANDERSON GRATZ, LEONARD HARRISON, SAMUEL HIRD, FRANK E. HOADLEY, GEO. A. KUHIRT, MAXWELL LESTER, HOUSTON LOWE, RUSSELL W. MOORE, ADELBERT MOOT, W. H. MULLINS, WILLIAM T. NOONAN, JAMES M. PRENDERGAST, AARON B. SALANT, HANS SCHMIDT, JAMES R. STRONG, THEO. F. THIEME, EDWIN J. TREFRY, PHILIP V. R. VAN WYCK, ALBERT B. WIEMANN, and MASTER DEAN HAWLEY HOLDEN.

Associate Members, MESDAMES T. P. BURGESS, WILLIAM C. MCGOWAN, PROFESSORS JOHN M. BURNAM, JAMES HARDY DILLARD, CHARLES H. O'DONOGHUE, THE HON.

D. H. Beyea, Lieut. Col. Frank T. Woodbury, Messrs. Russell M. Bennett, Robert D. Carson, Percival W. A. Fitzsimmons, Lloyd Hemingway, Morton C. Kahn, John T. Pirie, F. A. Purdy, and Ernest Windle.

Dr. James Douglas, a trustee and benefactor of the American Museum of Natural History since its organization in 1869, died at his home in New York City on June 25, 1918, in his eighty-first year. By the terms of his will, dated December 4, 1917, the sum of $100,000 was bequeathed to the American Museum. Dr. Douglas was for many years rated as one of the foremost metal and mining authorities of the world. He was born in Quebec, Canada, and received his education at Queen's University, Kingston, and at the University of Edinburgh. For his work in the field of hydrometallurgy, in which he was associated with Dr. T. Sterry Hunt, famous for his copper research, McGill University, Montreal, awarded him the degree of Doctor of Laws. After some years spent in giving instruction he resigned the professorship in chemistry which he held in Morrin College, Quebec, to become a mining engineer, and in 1875 came to Phœnixville, Pennsylvania, where he took charge of a copper plant. Later he became identified with the copper industry of Arizona, New Mexico, and Sonora, Mexico, as well as with the railroads, and together with his early associates in business, the late William E. Dodge and the late D. Willis James, was largely responsible for the development of that region. He was president of the Copper Queen Consolidated Mining Company, one of the largest copper producing companies of the country, and also of the El Paso and Southern Railroad and allied lines. In addition, Dr. Douglas was a historian and writer of note and a philanthropist. His writings include *Canadian Independence, Imperial Federation and Annexation, Old France in the New World,* and *New England and New France—Contrasts and Parallels in Colonial History,* besides numerous technical articles relating to minerals and mining. He was prominent in many organizations, including the American Institute of Mining Engineers, of which he was president twice, the American Philosophical Society, the American Geographical Society, and the Society of Arts of London.

In honor of Mr. Joseph H. Choate, Professor Henry Fairfield Osborn has prepared a memorial volume, which contains an account of Mr. Choate's connection with the American Museum from 1869 to 1917. An address which he delivered in 1874, giving a *résumé* of the history of the Museum, is included, and the volume closes with his last paper on the same subject, which was published in the American Museum Journal for May, 1917. Copies of the memorial have been distributed to the following persons and institutions: Mrs. Joseph H. Choate; Messrs. J. P. Morgan; Frederick F. Brewster; Thomas De Witt Cuyler; Viscount James Bryce; the Library of Congress; Salem Public Library; the Harvard Club; the Association of the Bar, New York City; the Metropolitan Museum of Art; and the trustees and library of the American Museum.

As all available space in the new National Museum at Washington is occupied at present by the Bureau of War Risk Insurance, the building has been closed to the public by the board of regents. It will be reopened when the new office building of the bureau, at Vermont Avenue and H Street, is ready for occupancy.

President Wilson has authorized a loan of one million dollars from the special defense fund placed by Congress at his disposal to the Forest Service for fire-fighting expenses, in recognition of the fact that protection of the national forests is an important and essential war activity. Early drouth, high winds, electrical storms, and depletion of the regular protective force as a result of the war, have combined to make the present fire season in the Northwest the most serious with which the Government has ever had to cope.

On Bastille Day, July 14, in commemoration of the national holiday of the French Republic, the French flag was raised at the American Museum of Natural History, and a cablegram was sent by President Henry Fairfield Osborn to Paris, carrying the greetings of the staff of the American Museum to their scientific colleagues in the ancient Muséum National d'Histoire Naturelle, an institution which entered a period of great achievement following the first Bastille Day. An immediate response from the director of

the Muséum d'Histoire Naturelle brought a return message of cordial greeting with an expressed hope for early victory to the Allied nations.

MAJOR FRANK M. CHAPMAN, who has lately been director of publications for the American National Red Cross at Washington, D. C., has been appointed Red Cross commissioner to Latin American republics. He leaves for South America in October.

NOT for a hundred years will there again be a solar eclipse like that of the summer of 1918 when the shadow passed across the whole United States from Washington to Florida. The war prevented expeditions from abroad, but from our own country expeditions from Lick, Mount Wilson, Yerkes, Naval, and other observatories, as well as from the Smithsonian Institution and the United States Weather Bureau, were sent to the Northwest where opportunity for observation was greatest. Dr. W. W. Campbell, director of Lick Observatory, whose interesting account has appeared in many publications, made observations and obtained photographs at Goldendale, Washington, exactly on the middle line of the path of the eclipse.

THE American Museum service roll of the war now numbers sixty-five names. These include the men who are actively engaged in the Army, Navy, and aviation service, and also those in the Red Cross and scientific divisions. Lieutenant H. E. Anthony, after about three months in France with his company of field artillery, was ready to go into action, when he received orders from headquarters to return to the United States to drill troops for the front. The order carried with it a promotion to the rank of captain. He is at Camp Lewis, Washington. Lieutenant Leo E. Miller is now chief observer in aviation and has been transferred to Camp Jackson, South Carolina. Lieutenant James P. Chapin is employed in the south of France as billeting officer, covering the ground on a motor cycle or in a Ford car. Mr. C. H. Rogers is now a sergeant in physical training at Camp Meade, Maryland. Mr. Howarth Boyle was one of twenty to volunteer from Naval Base Hospital No. 1 for first aid work in the trenches. Many of the boys have had their baptism of fire, having been in and out of the trenches many times. Private Chris Schroth was the first to be wounded, losing two fingers in his third trip "over the top." Private Albert J. Kelly was wounded with shrapnel. Both are now ready for action again. Private Benjamin Connolly has received the rank of corporal since he went across a few months ago. Sergeant Charles A. Connolly, of the old 69th regiment of New York, formerly an attendant in the Museum, lost his life in the heavy fighting of the Americans during the last part of July.

Sergeant Charles A. Connolly met his death while fighting for the cause of the Allies at Château-Thierry. He was twenty-five years old, one of three sons employed at the American Museum and all called into Army service early in the present conflict. As a member of the old 69th regiment of the National Guard of New York, he had been in active service on the Mexican border

THE "Museum Letter," issued by the publicity department of the American Museum under the direction of Mr. George N. Pindar, is designed to keep the boys in service in touch with the happenings "at home," and also to give them news concerning one another.

THE American Ornithologists' Union will hold its thirty-sixth stated meeting at the American Museum of Natural History, November 12–14, 1918. A business meeting of the Fellows and Members will take place on the evening of the 11th.

THE JOURNAL is particularly glad to publish in this October issue the paper on the

history of the American Ornithologists' Union. This organization may almost be looked upon as one of the collateral branches of the American Museum, having been born in the Museum in 1883, having drawn one fourth of all its officers from the Museum's staff, and having held one third of all its meetings within the Museum's walls. The thirty-sixth annual meeting of the Union will mark the twelfth to be held in the American Museum.

DR. CLARK WISSLER, curator of anthropology at the American Museum, spent July as the guest of Dr. W. T. Mills, state archæologist of Ohio, who is making an archæological survey of the famous Flint Ridge district between Columbus and Zanesville. Flint Ridge is an outcrop of flint-bearing limestone extending east and west for ten or more miles. The entire surface of the ridge is covered with pits dug by prehistoric miners while searching for flint suitable for making implements. This is one of the most remarkable prehistoric flint workings known in America and perhaps in the world. Adjacent to the ridge are large accumulations of flint chips or fragments, struck off from larger pieces in the shaping of arrowheads or other articles. These deposits in some cases reach a depth of fifteen feet and the material is now being utilized for road building in the vicinity. Scattered along the small streams whose sources lie in Flint Ridge, broken stone implements made of flint taken from the pits on the ridge, together with fragments of pottery and bone, mark former Indian village and camp sites.

Dr. Wissler was occupied during the remainder of the summer in a reconnaissance of southeastern Indiana, with a view to determining how far westward the Ohio mound area extends, in order to supplement the very full and accurate map of mounds and earthworks which Dr. Mills has prepared for the state of Ohio. For this purpose all the counties of southeastern Indiana were visited and the situation and character of the earthworks mapped. A number of very important sites were located for future exploration by the Museum.

THE present year has been a period of great activity in wooden ship building. In May, according to the report of the United States Shipping Board, an average of one ship a day was launched. During the first seventeen days of that month 60,000 tons were added to the American merchant marine. On a record-breaking day four launchings were reported, totaling 14,500 tons. On the Fourth of July, fifty-two ships were launched throughout the United States. For the most part these wooden ships are built of fir or part fir, and more than one half of the total number launched are produced by the shipyards of Oregon and Washington.

A THIRD edition of *Men of the Old Stone Age*, by Henry Fairfield Osborn, was issued from the press of Charles Scribner's Sons on September 13. This edition, which is in less expensive form than the others, brings the whole issue above the ten thousand mark. The new volume includes additional illustrations and appendixes bearing upon palæolithic implements of northern Africa and Spain. Arrangements have been made by the same publishers to bring out an edition in French of Professor Osborn's work on *The Origin and Evolution of Life*.

CAPTAIN RALPH SANGER, of the American aviation service, met his death the latter part of September in a flying accident in France. A cable to Mitchel Field, Mineola, indicates that the accident occurred in a training field many miles behind the lines. Captain Sanger was a son-in-law of President Henry Fairfield Osborn of the American Museum. He was graduated from Harvard University in 1904. After war was declared he went to Plattsburg and received a commission as captain of infantry. Later he was sent to the aviation camp at Dallas, Texas, where he showed peculiar adaptability for air service, so that when he was transferred to Mitchel Field he was recognized as one of the most promising aviation commanders in America. Captain Sanger's wife, who was Miss Virginia Sturges Osborn, is serving as a nurse in France.

DR. THORILD WULFF, Swedish botanist and geologist, after accomplishing a valuable piece of scientific work along the coast of northwest Greenland in the spring of 1917, died on the homeward trip. It is reported that he continued work to the last, dictating to his companion, Lauge Koch, a survey of the vegetation about Peabody Bay. The party, which was under the leadership of Mr.

Underwood and Underwood

Captain H. E. Anthony last spring accompanied the 309th F. A. regiment to France as First Lieutenant. After three months, there came promotion to a captaincy with the order to return to the United States to drill and take across a new company. Captain Anthony is now at Fort Lewis, Washington, training a company of field artillery for service at the front

Knud Rasmussen, left North Star Bay early in April, 1917, traveled to Peary Land, and returned across the Greenland ice cap. By the time De Long's Fjord was reached, game gave out and the men were obliged to retrace their steps. They suffered incredible hardships on the way back, and at Cape Agassiz, Rasmussen and one of the Eskimos started on ahead on a forced march for aid, while the others followed slowly. After a few days' travel without food, Dr. Wulff weakened and died. In the fall, Peter Freuchen, the Danish factor at North Star Bay, made an unsuccessful attempt to recover the body.

DESPITE the general policy of the American Museum to suspend field work until the close of the war, it has been deemed expedient to continue certain explorations. Two expeditions have been sent to China: The Second Asiatic Zoölogical Expedition, in charge of Mr. Roy C. Andrews of the department of mammalogy, sailed on June 22, and plans to supplement the work of the Asiatic Zoölogical Expedition of 1916–1917, if possible penetrating farther into the interior; The Third Asiatic Zoölogical Expedition, under the leadership of Mr. Paul J. Rainey, accompanied by Mr. Edmund Heller as naturalist, left San Francisco on July 27, its purpose being to collect large game animals in the Far East. In Aztec, New Mexico, Mr. Earl H. Morris, assisted by Mr. B. T. B. Hyde, has continued the excavation of the Indian ruins, which are yielding important collections and historic data.

THE department of vertebrate palæontology of the American Museum has lately added to its study collection, through the gift of Mr. Warren Delano, of New York, the skull and vertebral column of a colt which is a cross between an Arabian steed and a Norwegian horse. Whether the Arabian type, with its five lumbar vertebræ as contrasted with the six lumbar vertebræ of the commoner species, would be perpetuated by such a crossing of species, or whether the reverse would be true, is the question which interests scientists. The present specimen shows both influences. It follows the Arabian type in having but twenty-three dorsal-lumbar vertebræ instead of twenty-four as in the common horse, but to the last of the dorsal vertebræ there are attached, instead of true ribs, the transverse processes of lumbar vertebræ articulated like ribs and having on one side, not directly joined to the process, a little abortive rib. Technically, however, the possession of the correct number of vertebræ seems to place the specimen with the Arabian species.

IN June and July Dr. C.-E. A. Winslow, of the American Museum, was in charge of the courses in bacteriology and hygiene at the Vassar College Training Camp for Nurses, where four hundred college graduates received the theoretical part of their training for service in the emergency created by the war. In August he gave an inten-

sive course in industrial hygiene at the Massachusetts Institute of Technology. As chairman of a committee appointed by the Committee on Higher Education and Special Training he was in charge of the work of preparing the official syllabus for instruction in hygiene and sanitation to be offered to the enlisted men in the Students' Army Training Corps at four hundred colleges this fall.

PROFESSOR HENRY SHALER WILLIAMS, dean of Cornell University, died at Havana on August 14. Professor Williams was well known both for his scientific attainments and for his kindliness and nobility of character. He was born in Ithaca, New York, on March 6, 1847. In 1868 he was graduated from Yale University, where later, after specializing in geology, palæontology, and biology, he received the degree of Ph.D. Preferring scientific work to a business career, he began teaching at Kentucky University, but was soon called to Cornell University, of which he became dean after a few years. While in this position he founded the honorary society of Sigma Chi, which is now the highest goal of scientific students in American colleges. By request of James D. Dana, who was retiring from the position, he accepted in 1892 the Silliman professorship of geology at Yale. There he edited the *American Journal of Science* and published numerous books on scientific subjects. For many years he was closely associated with Major Powell, Charles D. Wolcott, and T. W. Vaughan in investigations for the United States Geological Survey. He made special studies of the Devonian and Silurian periods both in this country and in Europe. From 1904 to 1912 he was again at Cornell, in charge of the geological department, but was chiefly engaged in scientific research. His surveys in Cuba from 1913 on have resulted in the starting of oil developments in western Havana and the eastern Pinar del Rio provinces. He was a member of many scientific societies in America and England. Among his many publications his *Geological Biology* has been a great stimulus to geological thought of later years.

DR. FRANK M. CHAPMAN, author of *The Distribution of Bird-Life in Colombia*, has been highly complimented by reviewers on

Major Barrington Moore, associate curator of woods and forestry at the American Museum, is at present in France assisting with the work of the *Comité interallié des Bois de Guerre*, which acquires and delivers to the Allies the timber needed in the conduct of the war. (See p. 415 for further notice of his work)

the quick completion and publication of the work. As Dr. Witmer Stone says in *The Auk*, "We realize at once that it is the most important contribution ever made to the subject of which it treats, but we further recognize in it the completion of a definite plan, clearly conceived and carefully carried out—an accomplishment that must be as much of a gratification to the author as it is to those who consult the volume. Too often, especially in America, important explorations have been made and extensive collections obtained which through force of circumstances remain unreported. . . ."

THE four species of South American birds reproduced in color in this number and described as new by Dr. Chapman are of particular interest because so distinctly different from species of North America. The toucans are the strangest of all the strange birds of Colombia, their huge bills serving as arms to reach fruits borne on branches not strong enough to bear the weight of the birds. Their bright colors, often in conflicting shades, are carried to the extreme on their enormous bills. That the color patterns of these birds look to us much like today's experiments in ship *camouflage* gives interest to Dr. Arthur A. Allen's statement that the species are difficult to see in the forest despite their conspicuous colors. Antpittas have been called "bobtailed robins," and the lower bird especially, of the two shown in the color plate, will remind the citizen of the United States of a young American robin. Antpittas are not well known to the citizens of South America, however. They are likely to escape the observation of even the native collectors, because so well concealed in their habitat, the moss-grown vegetation of the jungle floor. Fuertes' parrakeet lives in small flocks in the tree tops. Like other parrots, these birds seem to be mated for life, and in flight pairs always keep together. The finches of South America have habits similar to those of our chewinks or towhees.

A HOSPITAL for birds is a new departure, but one that seems eminently worth while in view of the results achieved by Dr. W. W. Arnold at Colorado Springs, as described in a summer number of *Bird Lore*. Dr. Arnold first became interested in treating wounded birds when a little girl brought to him a nighthawk and tearfully asked if he could not make it well just as he did the broken arms of little boys and girls. In a commodious aviary he constantly provides for from twenty-five to thirty feathered patients, disabled by contact with telephone wires or by other accidents which befall them in their migrations across country. While ministering to their needs he becomes acquainted with many unsuspected bird traits.

ARMAND THEVENIN, a French palæontologist, died on March 7 from the effects of poisonous gases with which he was experimenting in connection with the war. He was forty-eight years of age and well known for his careful and accurate work in the development of vertebrate palæontology. He was associated at the Muséum National d'Histoire Naturelle, in Paris, with palæontologists of international fame, and produced under such stimulus his interesting studies on fossil vertebrates. Thevenin gave especial attention to the subject of fossil Amphibia and was the discoverer of an interesting primitive reptile, *Sauravus costei*, a form which, as the most ancient reptile of France, is paralleled in America by the *Eosauravus copei*, described by Williston from the coal measures of Linton, Ohio. The publications of Thevenin number probably not more than a dozen papers. Of these the best known is his monograph on "Les Plus Anciens Quadrupèdes de France," in Tome V of the *Annales de Paléontologie*, a well-written, finely illustrated memoir which was awarded a prize by the Academy of Sciences; it epitomizes the ability and ideals of Armand Thevenin. His opinion that the vertebrates of the coal measures, although very ancient, were still a long way from their origin, agrees with the decision reached by students of early vertebrates in America.

THE Katmai Expedition of the National Geographic Society to the Valley of Ten Thousand Smokes, Alaska, in the summer of 1918, had for its object a reconnaissance of regions not yet visited, with a view to more intensive study of the volcanic phenomena. Because of war conditions, and particularly the difficulty of obtaining transportation, the party included only two men, Messrs. Jasper Sayre and Paul P. Hagelbarger, both members of last year's expedition.

After a somewhat hazardous voyage, in which their ship, the "Dora," was seriously hampered by ice floes in Bering Sea, they finally arrived at Naknek Lake by June 10, and in August, a wireless message announced the successful termination of the season's work. The topographic survey begun last year was extended to the shore of Bering Sea, adding about fifteen hundred square miles to the map and completing a section across the base of the Alaska Pen-

Lieutenant Leo E. Miller is chief observer in aviation at Camp Jackson, South Carolina. He is the author of a forthcoming book, *In the Wilds of South America*, recounting a story of travel and bird study while engaged in the work of the American Museum expeditions

insula from Katmai Bay to Naknek Lake, thus furnishing data for an accurate topographic map of the region. The first accurate measurement of the temperatures of volcano vents was obtained, through the use of pyrometers supplied by the geophysical laboratory of the Carnegie Institution. The highest temperature measured was 430 degrees Centigrade. The party reached Seattle in September, returning overland.

THE new Whitlock Premier printing press lately installed at the American Museum of Natural History is handling the various publications of the institution in good shape under the direction of Mr. Stephen Klassen. All Museum printing with the exception of the JOURNAL will henceforth be done through the medium of this press, which has four times the capacity of the small press previously in use. The work is further facilitated by a monotype machine, obviating the necessity of setting type by hand.

OBSERVERS have noted that as a rule birds on the battle front in Europe pay little attention to the noise and confusion around them. When a shell burst through the roof of a shed in the rafters of which swallows were nesting, the birds quickly took advantage of the new opening when flying back and forth to feed their young. According to H. Thoburn Clark, British ornithologist and soldier, the masked sites of guns are favorite nesting places. A brood of four young blackbirds was hatched within four feet of the muzzle of a gun; and when a German shell destroyed the stump of an apple tree in which a pair of blackcaps had made their home, they built in the adjoining stump and reared their brood successfully. The nest of a pair of hedge swallows in the hub of a broken wheel was continually under fire, yet the parental instinct of the birds exceeded their fear and they fed their young in disregard of dropping shrapnel and bursting shells. Obliviousness to danger often proves fatal, however, as is shown by the large numbers of dead birds found in the woods that have been exposed to a gas attack, and by the complete destruction of the bird life of the forests near Verdun through the effects of bombardment. It is said that droves of magpies have been driven from France by gunfire and have settled in England. At St. Omer, France, jackdaws have been known to leave their homes in the church steeples and attack passing aëroplanes, to which birds ordinarily seem to pay little attention.

MR. LESLIE SPIER has returned from central Arizona where he examined during the early summer prehistoric ruins in the White Mountains and the Rio Verde Valley. Later he visited the little-known Havasupai Indians, who live on a tributary of the Grand Cañon of the Colorado.

MR. LOUIS R. SULLIVAN, assistant curator in the department of anthropology at the American Museum, has received the commission of Second Lieutenant in the Sanitary Corps of the United States Army, with headquarters at Washington. Mr. Sullivan is attached to a newly organized division of the Sanitary Corps, which includes on its staff Messrs. C. B. Davenport, of Cold Spring Harbor, New York; B. W. Hawkes, of Milwaukee; and W. D. Wallace, of California. The work so far as planned is the oversight of the physical measurements made by the war boards with a view to their standardization. The lieutenants will visit the various army camps and make anthropometric studies of as many of the men in training as possible.

A NEW game bird law has been enacted by Congress to make effective the treaty recently entered into between the United States and Canada governing the killing of migratory birds. Under the rules based on the new law, uniform bag limits are set for the entire country, and the sale of wild migratory birds is prohibited absolutely. Permission to propagate migratory wild fowl on game farms and preserves may be obtained from the Department of Agriculture, and birds so raised may be sold as an addition to the food supply. Experiments have proved that many species of wild waterfowl may be raised successfully in captivity, and the sanction and protection of the Government will do much toward promoting this industry. There is now no spring open season for hunting wild fowl, and the fall open season is the same throughout the country, extending generally from September 1 to January 31, with certain exceptions, as in the case of the New England shore bird season which is from August 16 to November 30. The open season for individual species must not exceed three and one half months. States may make and enforce their own regulations, but only to afford greater protection to the birds and not to extend the open season or in any way to conflict with the Federal law. Continuous protection is given to all insectivorous birds, band-tailed pigeons, cranes, wood ducks, eider ducks, swans, curlew, and upland plover. No night hunting is permitted, the killing or capturing of migratory birds between sunset and a half hour before sunrise being prohibited. Provision is made for the collection of birds for scientific purposes, and under extraordinary conditions Federal permits may be issued to kill migratory birds which are injurious to agriculture.

THE large tusks of an elephant shot by Mrs. Carl E. Akeley on the American Museum expedition to Africa some years ago have lately been added to the collections of the American Museum. They weigh 112 and 115 pounds respectively and are the record tusks for the Mount Kenia region.

WAR is proving a stimulus to research. Incidentally, opportunity for the study of fossil plants of great scientific interest has been afforded by the opening of abandoned mines to increase the supply of fuel. Botany seems remote from things warlike, yet as a result of the food situation and the educational campaign of the Food Administration and the Department of Agriculture, for instance, American botanists have organized for a vigorous onslaught on plant diseases. A war board of American pathologists has been appointed. Humanity, it has been shown, in the last analysis is directly dependent on green plants for food, and of this food large amounts of wheat, fruits, and vegetables are lost annually through plant diseases. Some of these are known to be preventable—such as the stinking smut of wheat—and botanists realize their responsibility.

Among important war services performed by botanists are the study and cultivation of kelp and other marine algæ to augment the supply of potash needed by the Government, and the exploration of the country for certain species of sphagnum moss (especially *Sphagnum papillosum* and *S. palustre*) which are now recognized as valuable substitutes for absorbent cotton in the making of surgical dressings.

MR. H. G. BARBER spent the month of July at the American Museum in research work on the institution's collection of Hemiptera.

DR. C.-E. A. WINSLOW has been appointed consulting expert on industrial hygiene to the United States Public Health Service in charge of a squad of men studying conditions affecting the efficiency of munition workers.